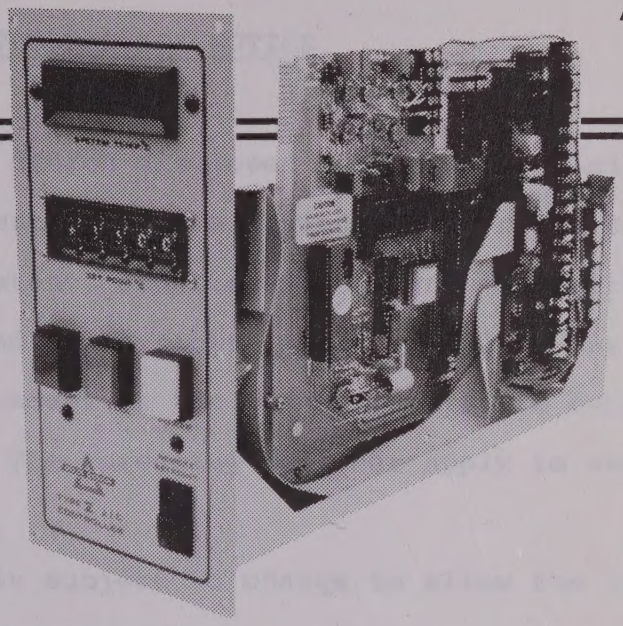
INSTRUCTION MANUAL

Model A1173
A1180
A1181



DELTA DESIGN INC.

TYPE V CONTROLLER

(Microcomputer Based)

ENVIRONMENTAL CONTROL EQUIPMENT FOR RESEARCH AND INDUSTRY
5725 KEARNY VILLA ROAD • SAN DIEGO, CALIFORNIA 92123

Type V-0780

Printed in U.S.A.

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Delta Design, Inc.
5725 Kearny Villa Rd.
San Diego, CA 92123

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SPECIFICATIONS

TEMPERATURE RANGE	$-73^{o}C$ to $+315^{o}C$ or $-73^{o}C$ to $+175^{o}C$ (Selectable with a jumper wire added) (Controller provides automatic shut-down if setpoint goes out of limits-display will indicate ----)
RESOLUTION	$0.1^{o}C$ (Digital Display and Setpoint)
CONTROLLER ACCURACY	$\pm 0.1^{o}C$
REPEATABILITY	$\pm 0.1^{o}C$
SENSOR	Type J thermocouple (iron-constantan)
COLD JUNCTION COMPENSATION	Built in; compensation error $< .01^{o}C/^{o}C$ ambient
SENSOR LINEARIZATION	23 Segment, digital, no calibration required
SHORT TERM STABILITY	$\pm 0.1^{o}C$
DEADBAND	$0.1^{o}C$
LINE VOLTAGE COMPLIANCE	$.001^{o}C$/volt RMS
CONTROL MODE	PID (Proportional/Integral/Derivative) Control, time proportioning with zero-voltage-switching, automatic heat or cool. PID function is "self-adaptive", i.e. the control function automatically adjusts itself for optimum chamber performance
HEAT OR COOL PROPORTIONAL BAND WIDTH	$6.4^{o}C$
DISPLAY UPDATE RATE	7.5 readings/sec.
TIME PROPORTIONING PERIOD	1 second
CALIBRATION PROCEDURE**	Two steps, no iterations 1. Ambient* 2. (Full scale) Slope

CONTROLLER OUTPUTS	Heat (zero crossover controlled solid state switch, 15 amp) Cool (Triac, 120V, 1 amp max.) "Error Nulled" (Contact closure, 200V peak, 0.5 amp non-inductive load)
ADDITIONAL FEATURES	Open thermocouple protection automatic shutdown (display will read "P. OP.") Remote setpoint input (parallel BCD) Remote temperature output (parallel BCD) "Null" contact closure output (temperature within $\pm$1.6°C of setpoint). Contact rated at 0.5 amp non-inductive.
CONTROLS	POWER ON-OFF Switch/indicator light COOL ON-OFF Switch/indicator light HEAT ON-OFF Switch/indicator light Temperature SETPOINT Control REMOTE SETPOINT Control Switch and indicator
VOLTAGE REQUIREMENTS (Derived from temperature chamber or handler)	120 VAC, 50/60 Hz, Single Phase
NET WEIGHT (approx.)	4 Lbs. (1.81 Kg)

* Unless otherwise specified:
Ambient temperature = 25°C $\pm$ 10°C
Line voltage = 115 VAC $\pm$ 10%

** This procedure calibrates the controller display and control simultaneously.

CONTROLLER MODEL NUMBERS

120V	208-240V	208-240V for 7650	Temperature Range	Front Panel
A1180-1	A1181-1	——	-73°C to +175°C	Vertical
——	——	A1173-2	-73°C to +175°C	Horizontal
A1180-3	A1181-3	——	-73°C to +315°C	Vertical
——	——	A1173-4	-73°C to +315°C	Horizontal

NOTE: IT IS RECOMMENDED THAT THIS MANUAL BE READ THOROUGHLY BEFORE CONNECTING EQUIPMENT TO ELECTRICAL POWER SOURCE.

INTRODUCTION

The Delta Design, Inc., Type V Controller has been specifically designed for use with Delta Environmental Test Chambers, Burn-In Chambers and Environmental Handlers, but is adaptable for use with any System which can utilize a type J (iron constantan) thermocouple as a sensor.

The Type V Controller is a high precision, microcomputer based Controller which utilizes digital techniques to provide control action for the temperature system. The Controller has the capability to change its control parameters automatically, thereby allowing the controlling action to adapt to a particular chamber and its unique thermal response characteristics. Utilizing these principles, the Controller's microcomputer automatically performs the regulation of both heat and/or coolant of the temperature system. This is accomplished by providing separate output time proportioning commands. The Type V Controller also provides built-in cold junction compensation and open thermocouple protection. The digital display located on the control panel indicates actual system temperature with a resolution of $0.1^{o}C$. The display also will provide feedback if the thermocouple sensor is open by displaying "P.OP.". If an improper setpoint is entered on the digital thumbwheel switches or the remote setpoint switch is activated without proper interface, the display will indicate "----". When the display indicates either "P.OP." or "----", heater power and/or coolant are disabled.

The Controller features built-in interface capability for remote or external temperature control setpoint selection as well as external programming.

Standard interface capabilities are: 16 lines I/O plus two handshake lines. The I/O lines may be steady state (BCD), latched input or computer interface. Optional interface capability is with the IEEE 488 Bus. This allows the Type V Controller to be directly tied into a computer controlled instrumentation system.

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1 PRINCIPLE OF OPERATION

1.1 Description

1.1.1 The Controller utilizes a type J (iron-constantan) thermocouple as a sensor in the temperature control system. The output of this sensor is amplified by a differential DC solid state feedback amplifier and is applied to the input of a 12 bit dual slope A/D (analog to digital) converter (the A/D converter incorporates automatic zero drift compensation and has a conversion rate of 7½ conversions per second). The converted sensor output signal can then be processed by the microcomputer in the temperature controller.

1.1.2 The microcomputer compares this system feedback signal to the setpoint as selected on the digital thumbwheel switches. The Controller, through the microcomputer, will regulate heat and/or coolant to maintain the set temperature, resulting in minimum coolant and power consumption.

1.1.3 The microcomputer determines error by numerically subtracting the system temperature from the setpoint. It performs other numerical operations as well, including integral feedback, rate feedback and the generation of time proportioning outputs to control the heat and cool drivers. It also provides a linear correction of the nonlinearities associated with the thermocouple. All of these operations done numerically eliminate linearization adjustments, rate adjustments and integration adjustments required to match the requirements of a particular system.

1.1.4 The Controller incorporates adaptive feedback control and measures the response of the thermal system it is controlling when the system is heating or cooling outside of the heat or cool proportional band (6.4°C). The controller uses this measured response to automatically adjust the variables in the temperature control algorithm so as to enhance the setting characteristics of the total system. This adaptive capability alleviates the need for adjustments other than the initial ambient temperature reading calibration and full scale calibration.

2 INITIAL SETUP

WARNING

Ensure that all sources of power have been removed from the equipment prior to installing, removing or servicing the Controller. The case of the triac switch assembly located on the Controller, is at power line potential when the POWER switch is ON.

CAUTION

Some components used on the Controller P.C. board are static charge sensitive. Unnecessary handling should be avoided. Removal of components from this board will VOID the Controller warranty.

2.1 Electrical Connection

2.1.1 Electrical connection is made between the Controller and the Chamber or Handler at TB1 and TB2 on the rear of the Controller. For terminal designations see D1650191 or D1650202.

2.1.2 When the Controller and the Chamber or Handler are purchased as a unit, the Controller will be installed in the unit and calibrated prior to shipment.

3 STARTING UP PROCEDURE

3.1 Controls

3.1.1 POWER Switch/Indicator Light - ON position - main power to the unit is ON. The white light is illuminated when power is ON.

3.1.2 COOL Switch/Indicator Light - ON position allows the Controller to apply coolant automatically to reach and maintain selected temperature in the test chamber. The blue light is steadily illuminated while the chamber is cooling. The light blinks when the chamber reaches selected temperature below ambient.

3.1.3 HEAT Switch/Indicator Light - ON position allows the Controller to apply heat automatically to reach and maintain selected temperature in the test chamber. The red light is steadily illuminated while the chamber is heating. The light blinks when the chamber reaches selected temperature above ambient.

3.1.4 Digital SETPOINT Switches - Chamber operating temperature is set by dialing the desired temperature into the five thumbwheel switches. The temperature setting capability ranges from -73°C to +315°C (or optional -73°C to +175°C).

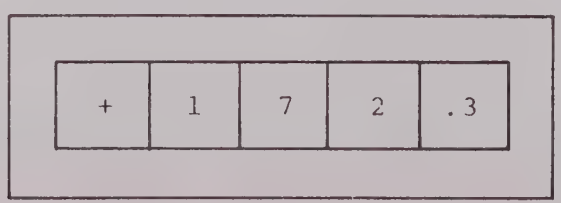
3.1.5 REMOTE SETPOINT Switch and Indicator - The temperature setpoint is normally obtained by setting a thumbwheel switch on the front panel. By actuating the REMOTE SETPOINT switch (LED illuminated), the Controller microcomputer will look at the information present at the "program socket." The program socket is a 25 pin "D" subminiature connector on which lines 1 through 16 are the 4 decades of BCD representing the digital setpoint. If there is no connection at the program socket, the Controller digital display will indicate (----) and heater power and/or coolant will be disabled.

3.2 Setting the Thumbwheel Switches

3.2.1 Description - Refer to example A.

3.2.1.1 Reading from right to left the first three switch segments are tenths, units, and tens of degrees respectively. These switches each have ten positions and are labeled 0 through 9. The fourth switch segment is hundreds of degrees and is marked 0, 1, and 2.

3.2.1.2 The fifth switch is marked (+) and (-). In the (+) position, all settings dialed in on the other segments will be greater than 000.0°C. In the (-) position the inverse will be true.



Example A

3.3 Calibration

3.3.1 Install a temperature sensor (thermocouple, resistance temperature detector, or thermistor) with the proper sensor leads in the center of the temperature chamber workspace and close the door. Connect the leads to an appropriate pyrometer or other suitable temperature measuring device.

3.3.2 Switch the Controller POWER switch to the ON position. Compare the temperature displayed on the Controller with the temperature on the recorder. On the Controller P.C. board 970 (D1644528), adjust the "AMBIENT" potentiometer (R24) until the digital display temperature agrees with the recorder temperature.

3.3.3 Switch the Controller HEAT switch to the ON position. Set the digital thumbwheel switches to +100°C. Allow time for the temperature to stabilize. On the Controller P.C. board 970 (D1644528), adjust the "SLOPE" potentiometer (R9) until the digital display temperature agrees with the recorder temperature.

3.3.4 The System is now calibrated. Verify the calibration by randomly selecting a test temperature. Allow the chamber to stabilize and verify that the actual temperature as shown on the recorder agrees with what is set on the Controller.

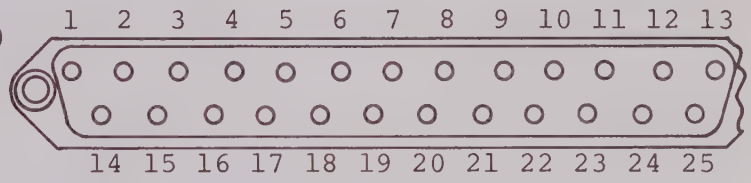
4 PROGRAMMING

4.1 Description

4.1.1 The following is the external program socket pinouts. The Controller microcomputer will utilize the information at this connector when the front panel REMOTE SETPOINT switch is activated (LED illuminated). The connector will accept 16 lines I/O plus 2 handshake lines. The I/O lines may be steady state (BCD), latched input or computer interface. Optional interface provides IEEE 488 Bus connection.

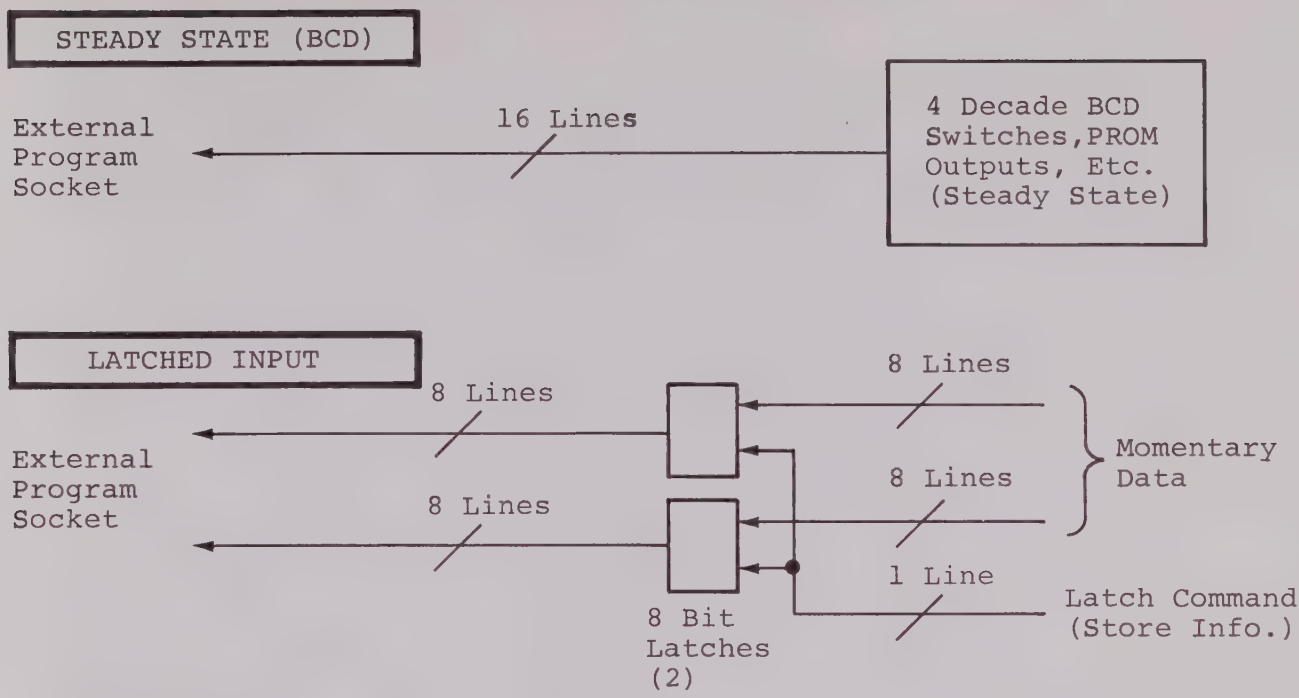
EXTERNAL PROGRAM SOCKET PINOUTS

Pin #	Function
1	1
14	2
2	4
15	8 (tenths (BCD))
3	1
16	2
4	4
17	8 (units (BCD))
5	1
18	2
6	4
19	8 (tens (BCD))
7	1
20	2
8	4 (hundreds (BCD))
21	Sign (logic) "1" signifies a minus temperature
9, 22, 10, 23	0 Volt (ground reference)
11	$\overline{\text{Null}}$ (logic) temperature difference between setting and actual system temperature greater than 1.6°C causes logic "1"
24	$\overline{\text{Temperature Interrogate}}$ (logic handshake line for external temperature reading)
12	Spare
25	Setpoint Valid (logic handshake for external temperature setpoint input)
13	+5V (50 ma. max.) Typically not connected to external units.



View looking at male interface connector

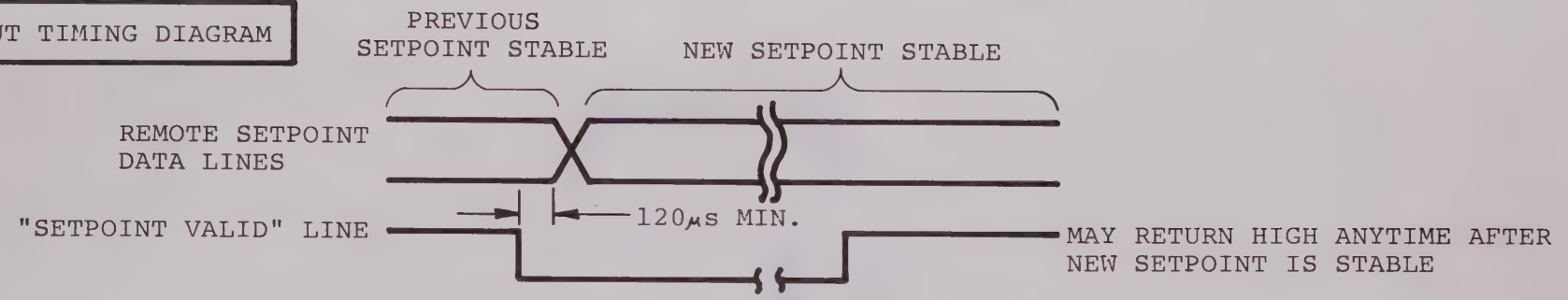
INTERFACE CAPABILITIES
(All data in parallel format)



5 WARRANTY

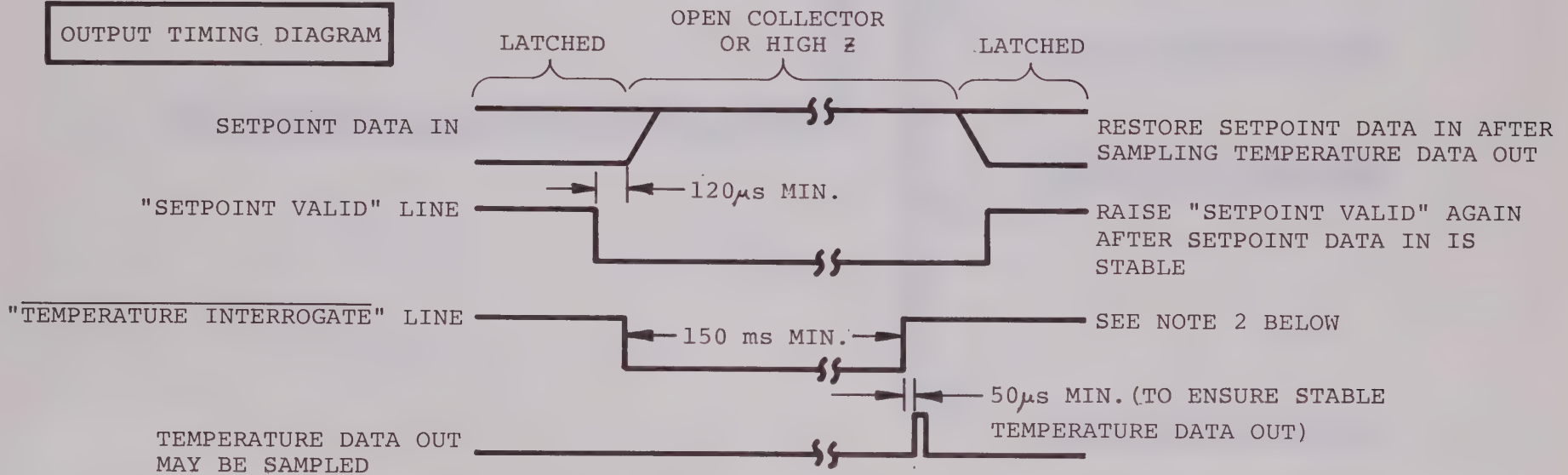
Delta Design, Inc. guarantees all products manufactured and sold by it to conform to published specifications and against defective material and workmanship for a period of 90 days from the date of our shipment. Temperature chambers and electronics are warranted for one year from date of shipment. All contactor assemblies are warranted for a period of 90 days or 1/2 million cycles. Obligation under these warranties is limited to repair or replacement by Delta at its plant or one of its authorized service stations, on any of our products which Delta determines to be defective or not in accord with stated specifications. Delta will not accept responsibility for any defect caused by improper use, nor will Delta assume liability for any unauthorized repairs or modifications to its products or materials, even though defective or not in accord with the specifications. In no case will responsibility extend to products, materials, or equipment not manufactured by Delta. All products to be returned to Delta's plant for warranty repair must have prior written approval from Delta Design, Inc., and all return transportation charges will be at the buyer's expense. Delta will not accept liability for any unauthorized returns. No liability will be accepted for any damages to customer's materials, and equipment due to the use or misuse of Delta's products, nor for any loss of profits or other special damages. Delta Design, Inc., reserves the right to change price, design features and/or specifications without notice.

INPUT TIMING DIAGRAM



NOTE 1. THE CONTROLLER SAMPLES THE REMOTE LINES ONCE EVERY 1.2 SECONDS. IF "SETPOINT VALID" IS FALSE AT THAT TIME, IT WILL HOLD THE PREVIOUS SETPOINT UNTIL THE NEXT SAMPLE.

OUTPUT TIMING DIAGRAM

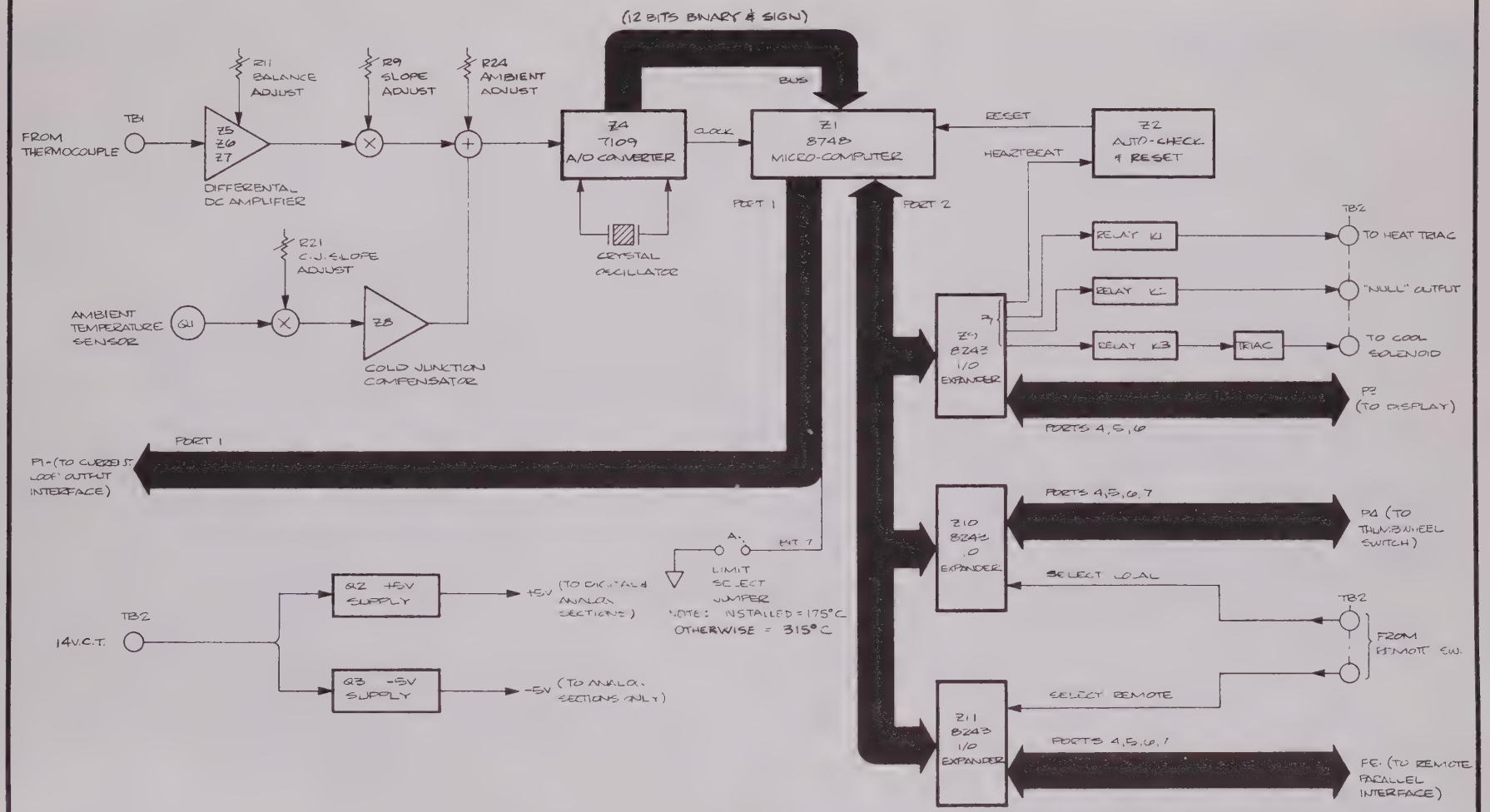


NOTE 2. TEMPERATURE DATA OUT IS SAMPLED EVERY 150 ms AS LONG AS "$\overline{\text{INTERROGATE}}$" AND "VALID" ARE HELD LOW. DATA OUT IS LATCHED WITHIN 50 μs AFTER "$\overline{\text{INTERROGATE}}$" RETURNS TO ITS HIGH LEVEL, AND IT REMAINS LATCHED UNTIL "VALID" GOES HIGH OR UNTIL "$\overline{\text{INTERROGATE}}$" AGAIN GOES LOW.

NOTE 3. THE PERIOD BETWEEN INTERROGATE CYCLES SHOULD BE >1.2 SECONDS. (SEE NOTE 1)

TIMING DIAGRAM-BIDIRECTIONAL PARALLEL BCD BUS
SK1046

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPD



DASH	QTY	NEXT ASSY	USED ON	SERIAL NO.	DATE EFF	DWG REV	MATERIAL ⚠			
APPLICATION				EFFECTIVITY			FINISH ⚠			

⚠ FINISH (IF APPLICABLE)

⚠ MATL (IF APPLICABLE)

NOTES: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .XX ± .03; .XXX ± .010
ANGLES: 0° 30'

HOLE TOLERANCES

.013 THRU .128	+.004 −.001	.351 THRU .500	+.006 −.001
.126 THRU .350	+.005 −.001	.501 THRU .750	+.008 −.001

DO NOT SCALE DWG

ENGINEERING ACTIVITY	
DESIGN	JCSYSTEMS INC.
DRAFTED	08 OCT 1979
CHECKED	
APPROV	
RELEASE	

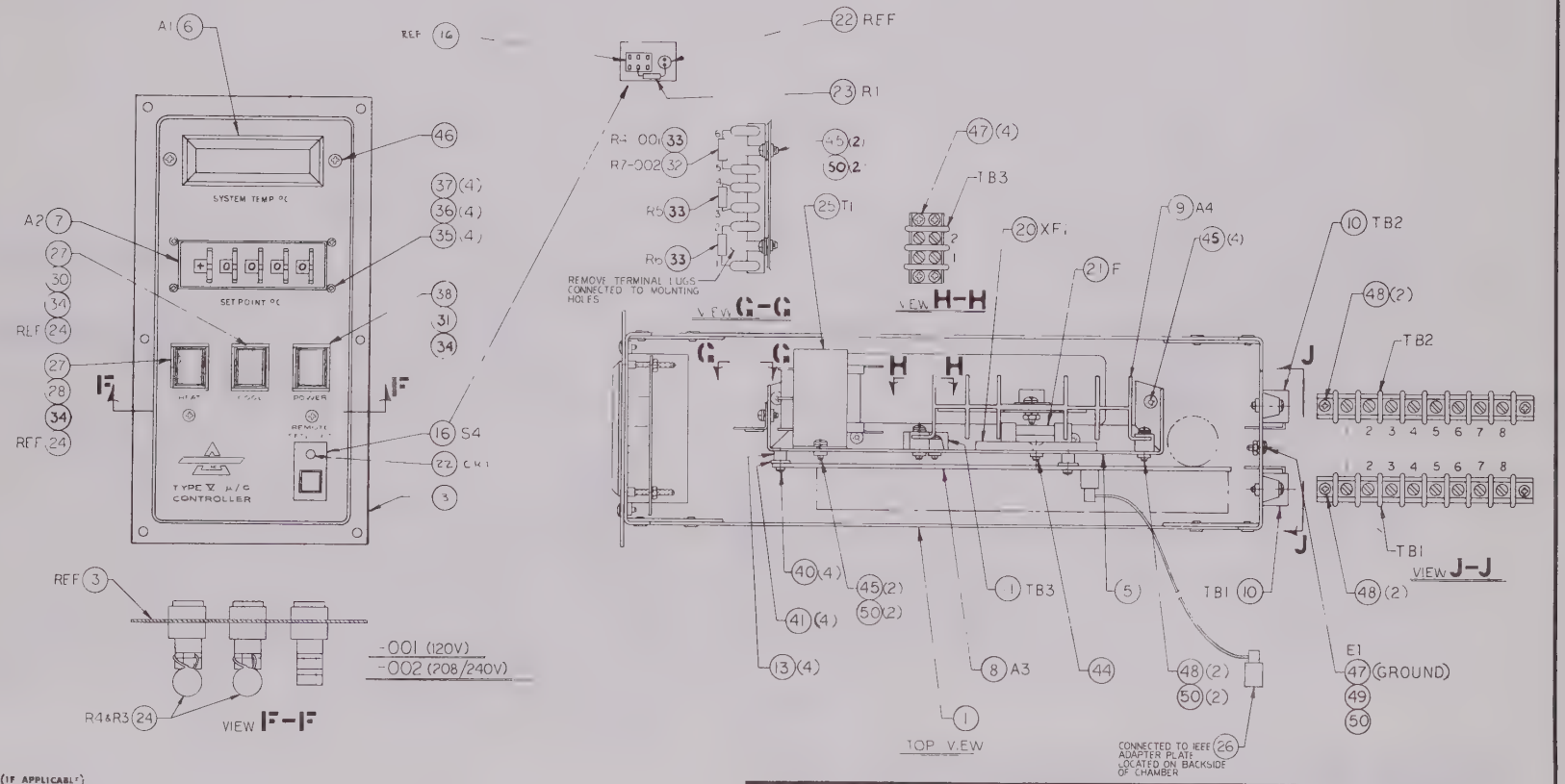
ENTERPRISES
ANT DIEGO CALIFORNIA

TITLE: BLOCK DIAGRAM - TEMPERATURE CONTROLLER MODEL A970

SIZE	CODE IDENT	
C		1045

SCALE N.A. 1644541 SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPD
	A	RE-DESIGNED PER ECO ADDED N/C BROWN LINE FOR WAS CONDITION	3-31-80 BRR	



/4\ FINISH (IF APPLICABLE)

2. TEMPERATURE RANGE SELECTION FOR THIS CONTROLLER IS MADE AT ITEM 8 SEE DRAWING D1644528 (SCE 970)

⚠ ~~MATL (IF APPLICABLE)~~

FOR 120, 208 OR 240 V WIRING, VERTICAL PANAL, SEE 1650191
FOR 208 OR 240 V WIRING, HORIZONTAL PANEL, SEE 1650202

NOTES: UNLESS OTHERWISE SPECIFIED

DASH QTY	NEXT ASSY	USED ON
001	END ITEM 181	
002	END ITEM 80	

APPLICATION | SERIAL NO. | DATE EFF | DWG REV | EFFECTIVITY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS .XX ±.03 .XXX ±.010
ANGLES 0°30'
HOLE TOLERANCES

MATERIAL ⚠ | FINISH ⚠

ENGINEERING ACTIVITY ECN M 1923

DESIGN	
DRAFTED	RANGE 11 13 79
CHECKED	
APPROV	
RELEASE	

DO NOT SCALE DWG

DELTA DESIGN INC.
A SUBSIDIARY OF CONMI INC.
SAN DIEGO, CA. 92123

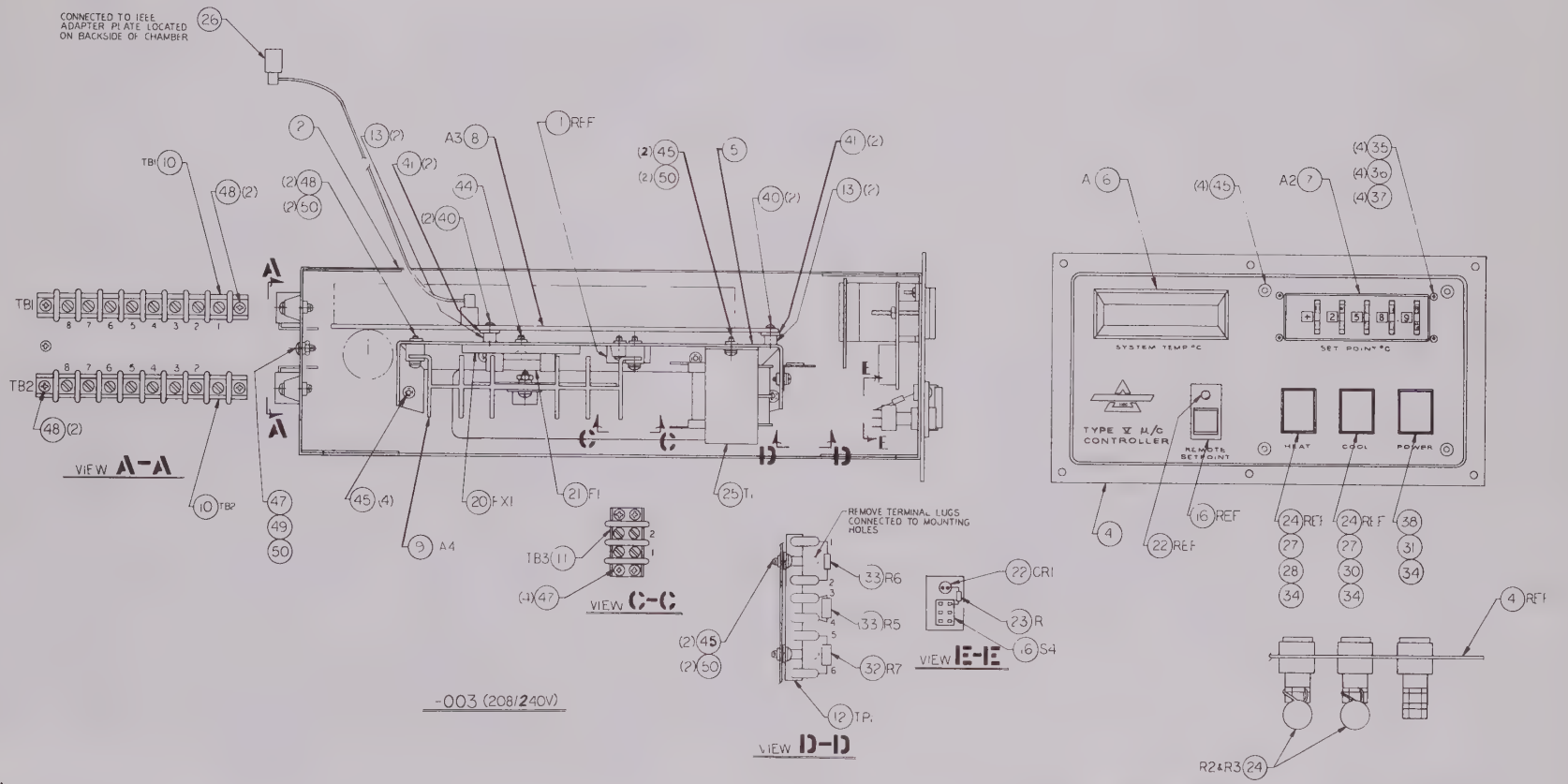
TITLE: TYPE V CONTROLLER (CHAMBER 120V & 208/240V VERTICAL)

SIZE D | CODE IDENT | 1650160

SCALE FULL | SHEET 1 OF 2

BLUE CARD

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPD
	A	PER E.N. M2340 THAMES, SEE SHEET 1	4-30-10	



⚠ FINISH (IF APPLICABLE)

⚠ MATL (IF APPLICABLE)

NOTES: UNLESS OTHERWISE SPECIFIED

DASH	QTY	NEXT ASSY	USED ON
		END ITEM 1179	
APPLICATION			

SERIAL NO.	DATE EFF	DWG REV
EFFECTIVITY		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS .XX ± .03 .XXX ± .010
ANGLES 0°30'
HOLE TOLERANCES
.812 +.004 -.001 (.811 +.004 -.001)
.120 (.1205 +.005 -.005)
.125 +.010 -.005 (.125 +.005 -.005)
.249 (.250 +.005 -.005)

MATERIAL ⚠
FINISH ⚠

ENGINEERING ACTIVITY

DESIGN	[illegible]
DRAFTED	
CHECKED	
APPROV	
RELEASE	

DO NOT SCALE DWG

DELTA DESIGN INC.
A SUBSIDIARY OF CONU INC.
SAN DIEGO, CA. 92123

TITLE: TYPE V CONTROLLER (CHAMBER 208/240 HORIZONTAL)

SIZE	CODE IDENT	
D		650160
SCALE FULL		SHEET 2 OF 2

PL 1650160 REV _____ SHT 1 OF 3

DESCRIPTION TYPE V CONTROLLER

NEXT ASSY END ITEM BY RANGE CK'D _____ APPD _____

REV ECN DATE BY APP
A M2040 6-24-85 PT

DELTA DESIGN
5725 KEARNY VILLA RD.
SAN DIEGO, CALIF

JOB NO _____ S.O. NO. _____
QTY _____ PROM DATE _____ ACT _____
RUN * _____ MACH _____

ITEM NO	ASSY & QTY -001	-002	-003	-004	INDENTURE	SIZE	DRAWING NO.	REV	DESCRIPTION	MFG OR MFG NO	STOCK OR PART NO.	JOB QTY	AUL	QTY REC	FAB CD	PURCHASING P.O. NO	QTY DUE	REC	MANUFACTURE STD HRS	ACT EST ACT COM	ACT COM	PLATE/PAINT IN	OUT	AREA
00	X					D	1650160		TYPE V CONTROLLER,	MODEL # A1180-3	1650160-001													
00									VERTICAL, 120V	CHAMBER														
00		X				D	1650160		TYPE V CONTROLLER,	MODEL # A1181-3	1650160-002													
00									VERTICAL, 208/240V	CHAMBER														
00			X			D	1650160		TYPE V CONTROLLER,	MODEL # A1173-4	1650160-003													
00									HORIZONTAL, 208/240V	CHAMBER														
00																								
00																								
00	REF	REF				D	1650191		WIRING DIAGRAM, VERT	120/208/240 V														
00			REF			D	1650202		WIRING DIAGRAM, HORIZ	208/240 V														
00																								
00																								
00																								
00																								
01	1	1				D	1650161		CHASSIS ASSY, VERTICAL		1650161-001													
01	1	1				D	1650161		CHASSIS, VERTICAL		1650161-101													
02	4	4				D	1650161		BRACKET	.036 (20 GA C.R.S.)	1650161-102													
03	9	9							#6-32 OHIO WELDNUT	SIC-6-S	1500175													
02			1			D	1650204		CHASSIS ASSY, HORIZONTAL		1650204-001													
01			1			D	1650204		CHASSIS, HORIZONTAL		1650204-101													
02			4			D	1650204		BRACKET	.036 (20 GA C.R.S.)	1650204-102													
03			11						#6-32 OHIO WELDNUT	SIC-6-S	1500175													
03	1	1				C	1650162		FRONT PANEL, VERTICAL		1650162-101													
	REF	REF				B	1650159		ARTWORK, FRONT PANEL, VERTICAL															
04			1			C	1650203		FRONT PANEL, HORIZONTAL		1650203-101													
			REF			C	1650196		ARTWORK, FRONT PANEL, HORIZONTAL															
05	1	1	1			D	1600261	D	CENTER BRACKET		1600261-101													
06	1	1	1			B	1650192		PCB NUMERIC DISPLAY A1	JCE # A1003	0900002													
	REF	REF	REF			C	1650193		SCHEMATIC	JCE # 1002														
07	1	1	1			B	1644549		PCB TEMP DIGI-SWT A2	JCE # A998	0900003													
	REF	REF	REF			B	1644548		SCHEMATIC	JCE # 997														

NOTES:

1650160
P/L

P.L. 1650160 REV ____ SHT 2 OF 3

DESCRIPTION TYPE V CONTROLLER

NEXT ASSY END ITEM BY RANGE CK'D ____ APPD ____

REV	ECN	DATE	BY	APP

DELTA DESIGN
5725 KEARNY VILLA RD
SAN DIEGO, CALIF

JOB NO ____ S.O NO ____
QTY ____ PROM DATE ____ ACT ____
RUN * ____ MACH ____

ITEM NO	ASSY B QTY -001	-002	-003	-004	INDENTURE	SIZE	DRAWING NO.	REV	DESCRIPTION	MFG OR MFG NO	STOCK OR PART NO	JOB QTY	AUL	QTY REC	FAB CD	PURCHASING P.O. NO	QTY DUE	REC'D	MANUFACTURE ACT STD HRS	EST ACT COM	ACT COM	PLATE/PAINT IN	OUT	AREA
08	1	1	1			D	1644528		PC BOARD ASSY A3	JCE # A970C	0900001													
	REF	REF	REF			D	1644550		SCHEMATIC	JCE # 969														
09	1	1	1			C	2635445	F	TRIAC ASSY A4		2635445-001													
	REF	REF	REF			C	1635446	E	SCHEMATIC, TRIAC ASSY															
10	2	2	2						TERMINAL BD TB1 & TB2		1400520													
11	1	1	1						TERMINAL BD TB3		1400508													
12	1	1	1						TERMINAL STRIP TP1		1400506													
13	4	4	4						STANDOFF	FORCE #350-1300-10-07-00	4100092													
~~14~~	~~2~~	~~2~~	~~2~~						~~SWITCH S1 & S2~~	~~CARLING #2GA50-D-TB-B~~	~~1400064~~													
~~15~~	~~1~~	~~1~~	~~1~~						~~SWITCH S3~~	~~CARLING #2GR50-D-TB-B~~	~~1400065~~													
16	1	1	1						SWITCH S4	C&K #8261J82	1400180													
~~17~~	~~1~~	~~1~~	~~1~~						~~LIGHT, RED DS1~~	~~IDI #26200#11~~	~~1400060~~													
~~18~~	~~1~~	~~1~~	~~1~~						~~LIGHT, GREEN DS2~~	~~IDI #26200#15~~	~~1400061~~													
~~19~~	~~1~~	~~1~~	~~1~~						~~LIGHT, WHITE DS3~~	~~IDI #26200#14~~	~~1400062~~													
20	1	1	1						FUSE HOLDER XF1	LITTLE FUSE #356001	1400053													
21	1	1	1						FUSE 1AMP F1	LITTLE FUSE #314001	1400030													
22	1	1	1						LED CR1	FAIRCHILD #FLV110	1400344													
23	1	1	1						RESISTOR 680Ω ½W	R1	0368000-500													
24	2	2	2						VARISTOR R2 & R3	GE #V180ZA10	1400010													
25	1	1	1						TRANSFORMER T1	JC SYSTEM #241-6-1456	0900005													
26	1	1	1						CABLE ASSY	C801835 JC SYSTEM	0900004													
27	2	2	2						SWITCH MAINTAINED	EAD # 31-261	1400167													
28	1	1	1						LENS CAP RED	EAD # 31-901.2	1400168													
~~29~~		~~1~~	~~1~~						~~RESISTOR R4~~															
30	1	1	1						LENS CAP BLUE	EAD # 31-901.6	1400169													
31	1	1	1						LENS CAP WHITE	EAD # 31-901.9	1400170													
32		1	1						RESISTOR 8.2K 3WATT R7	DALE	060005													
33	3	2	2						RESISTOR 2.7K 3WATT R4,	R5, R6 DALE	0302723-500													
34	3	3	3						LAMP 60V .02 AMP	EAD # 31-963.4	1400085													
35	4	4	4						#2-56 x 3/8 PHP-MS		6802563-804													
36	4	4	4						#2-56 HEX NUT		6702560-001													
37	4	4	4						#2 SPLIT LOCK WASHER		6602010													
38	1	1	1						SWITCH MAINTAINED	EAD B 31-262	1400171													

NOTES:

1650160
P/L

P.L. 1650160 REV ____ SHT 3 OF 3

DESCRIPTION TYPE V CONTROLLER

NEXT ASSY ____ BY ____ CK'D ____ APPD ____

REV	ECN	DATE	BY	APP

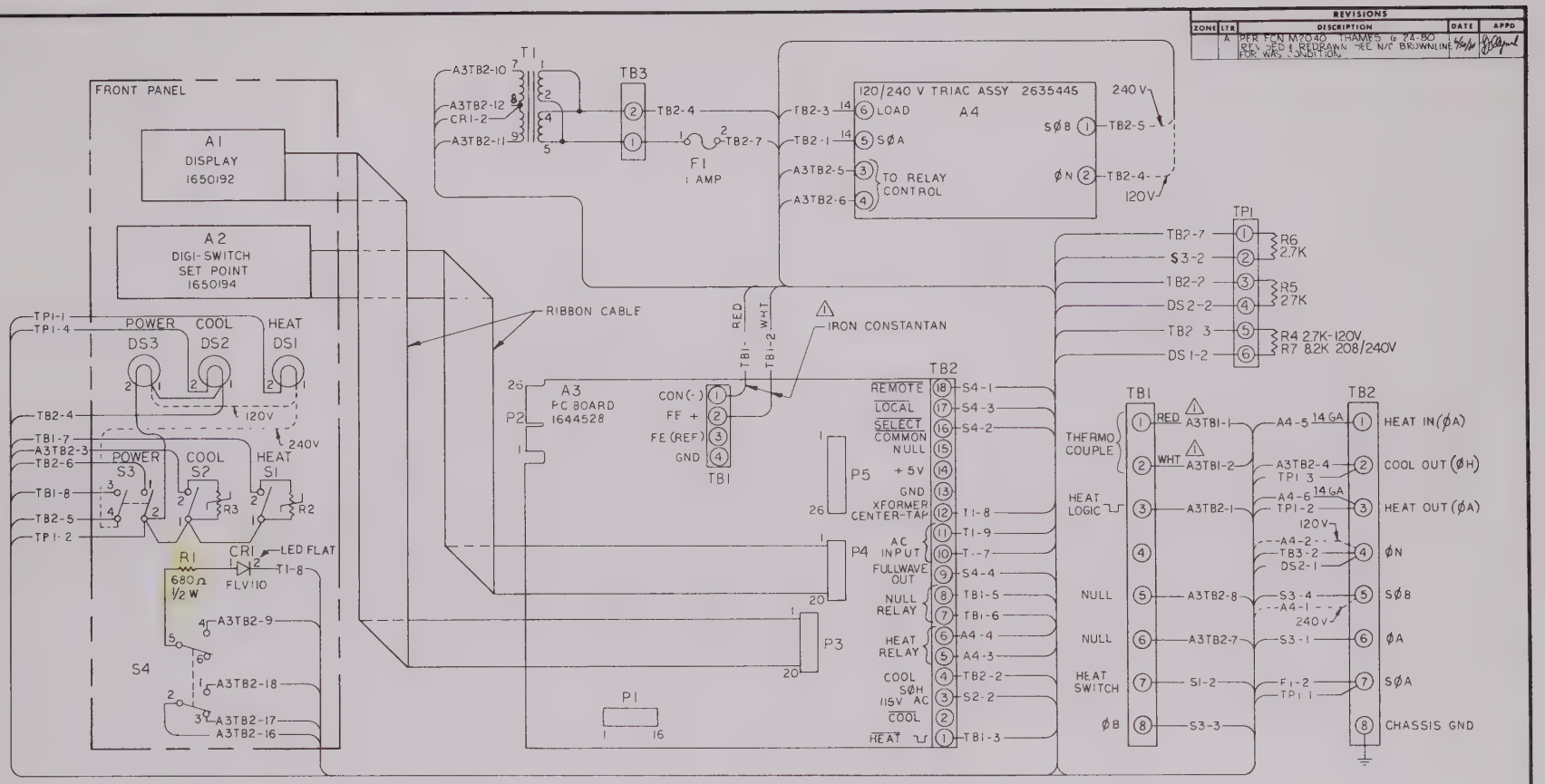
DELTA DESIGN
5725 KEARNY VILLA RD.
SAN DIEGO, CALIF

JOB NO. ____ S.O. NO. ____
QTY ____ PROM DATE ____ ACT ____
RUN * ____ MACH ____

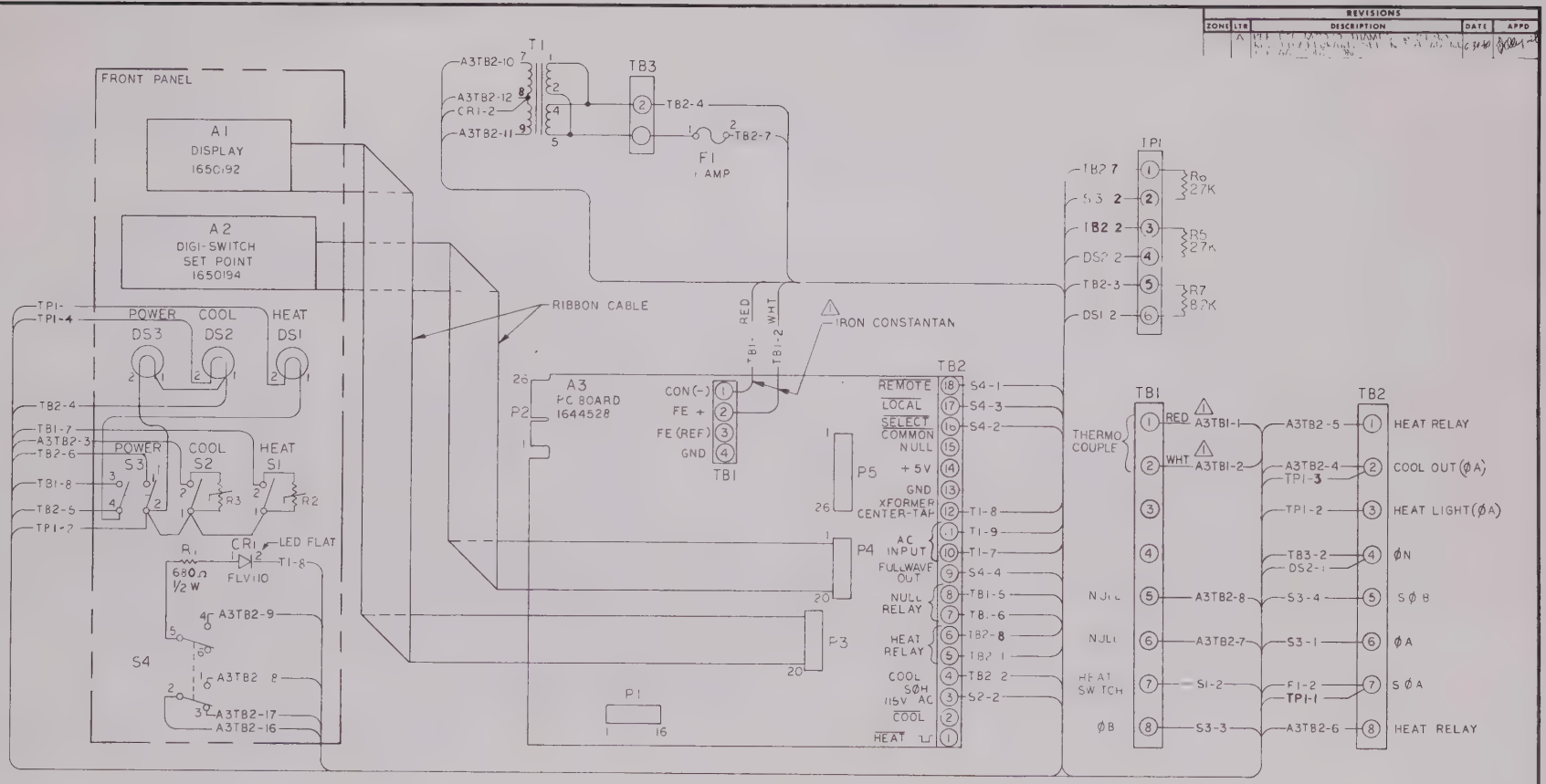
ITEM NO	ASSY & QTY -001	-002	-003	-004	INDENTURE	SIZE	DRAWING NO.	REV	DESCRIPTION	MFG OR MFG NO.	STOCK OR PART NO.	JOB QTY	ALL	QTY REC	FAB CD	PURCHASING P.O. NO	QTY	DUE	REC	MANUFACTURE ACT STD	EST HRS	ACT COM	ACT COM	PLATE/PAINT IN	OUT	AREA
39																										
40	4	4	4						*4-40 x 1/4 PHP-MS		6804401-404															
41	4	4	4						*4 FIBER WASHER		6604008															
42																										
43																										
44	1	1	1						*6-32 x 3/8 FHP-MS		6806323-801															
45	8	8	12						*6-32 x 1/4 PHP-MS		6806321-404															
46	4	4	4						*6-32 x 1/4 BHS-MS		6806321-499															
47	5	5	5						*6-32 x 3/8 PHP-MS		6806323-804															
48	6	6	6						*6-32 x 1/2 PHP-MS		6806321-204															
49	1	1	1						*6-32 HEX NUT		6706320-001															
50	7	7	7						*6 SPLIT LOCK WASHER		6606010															
51																										
52																										
53																										
54																										
55																										
56																										
57																										
58																										
59																										
60																										
61																										
62																										
63																										
64																										
65																										
66																										
67																										
68																										
69																										
70																										
71																										

NOTES: NO RESISTORS REQD ON EAD POWER SWITCH #1900171

1650160
P/L


REVISIONS
ZONE LTR DESCRIPTION DATE APPD
A PER ECN M2040 THANES 6 24 80 REV JED & REDRAWN KE N/C BROWNLINE FOR WAS CONDITION 6/24/80
FRONT PANEL
A1 DISPLAY 1650192
A2 DIGI-SWITCH SET POINT 1650194
POWER COOL HEAT
DS3 DS2 DS1
S3 S2 S1
R1 680Ω 1/2 W
CR1 LED FLAT FLV110
S4
A3TB2-9
A3TB2-18
A3TB2-17
A3TB2-16
T1
A3TB2-10
A3TB2-12
CR1-2
A3TB2-11
TB3
TB2-4
TB2-7
F1 1 AMP
120/240 V TRIAC ASSY 2635445 A4
LOAD
SØA
TO RELAY CONTROL
SØB
ØN
240V
120V
TB2-3
TB2-1
A3TB2-5
A3TB2-6
TB2-5
TB2-4
TP1
R6 2.7K
R5 2.7K
R4 2.7K-120V
R7 8.2K 208/240V
TB2-7
S3-2
TB2-2
DS2-2
TB2 3
DS1-2
RIBBON CABLE
RED
WHT
IRON CONSTANTAN
A3 PC BOARD 1644528
P2
P5
P4
P3
P1
CON(-)
FF +
FE (REF)
GND
TB1
TB2
REMOTE
LOCAL
SELECT
COMMON
NULL
+5V
GND
XFORMER CENTER-TAP
AC INPUT
FULLWAVE OUT
NULL RELAY
HEAT RELAY
COOL
SØH 115V AC
COOL
HEAT
S4-1
S4-3
S4-2
T1-8
T1-9
T-7
S4-4
TB1-5
TB1-6
A4-4
A4-3
TB2-2
S2-2
TB1-3
THERMO COUPLE
HEAT LOGIC
NULL
NULL
HEAT SWITCH
ØB
RED
WHT
A3TB1-1
A3TB1-2
A3TB2-1
A3TB2-8
A3TB2-7
S1-2
S3-3
A4-5 14 GA
A4-6 14 GA
TP1 3
TP1-2
120V
A4-2
TB3-2
DS2-1
S3-4
A4-1
240V
S3-1
F1-2
TP1-1
HEAT IN (ØA)
COOL OUT (ØH)
HEAT OUT (ØA)
ØN
SØB
ØA
SØA
CHASSIS GND
3-ALL WIRES 20AWG TEFLON UNLESS NOTED
FINISH (IF APPLICABLE)
CONNECTIONS FOR 208 & 240V ARE SAME
MATL (IF APPLICABLE)
WRAP WIRE AROUND SCREW
NOTES: UNLESS OTHERWISE SPECIFIED
1650160 181
1650160 180
DASH QTY NEXT ASSY USED ON
APPLICATION
SERIAL NO. DATE EFF DWG REV
EFFECTIVITY
MATERIAL
FINISH
ENGINEERING ACTIVITY
ECN M1923
DESIGN
DRAFTED RANGE 11/16/79
CHECKED
APPROV
RELEASE
DO NOT SCALE DWG
DELTA DESIGN INC.
A SUBSIDIARY OF CONIC INC.
SAN DIEGO, CA. 92126
TITLE: WIRING DIAGRAM 120/208-240 V VERTICAL PANEL TYPE V CONTROLLER
SIZE D
CODE IDENT
1650191
SCALE
SHEET 1 OF 1

BLUE CARD



3-ALL WIRES 20 AWG TEFLON UNLESS NOTED

~~FINISH (IF APPLICABLE)~~

CONNECTIONS FOR 208 & 240 V ARE SAME

~~MATL (IF APPLICABLE)~~

WRAP WIRE AROUND SCREW

NOTES: UNLESS OTHERWISE SPECIFIED

–	–	1650160	1						
DASH QTY	NEXT ASSY	USED ON	SERIAL NO.	DATE EFF	DWG REV	MATERIAL			
APPLICATION			EFFECTIVITY			FINISH			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS .XX ±.03 .XXX ±.010
ANGLES 0° 30'
HOLE TOLERANCES

ENGINEERING ACTIVITY: ECN MI-23

DESIGN	
DRAFTED	RANGE 11/16/79
CHECKED	
APPROV	
RELEASE	
DO NOT SCALE DWG	

DELTA DESIGN INC.
A SUBSIDIARY OF CONIC INC.
SAN DIEGO, CA. 92123

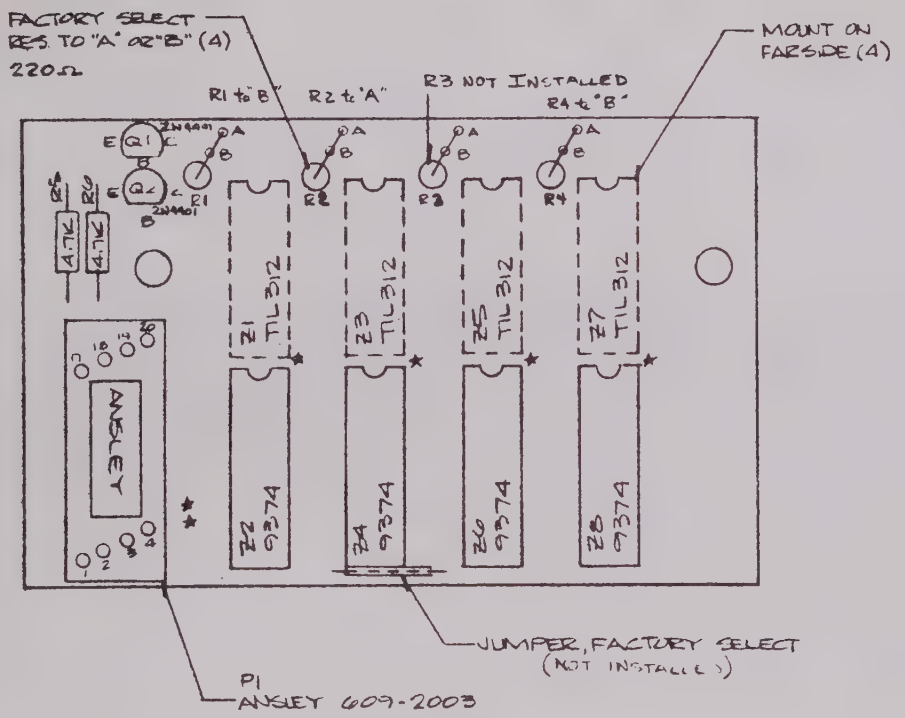
TITLE: WIRING DIAGRAM
208-240 V HORIZONTAL PANEL
TYPE V CONTROLLER

SIZE	CODE IDENT	
D		1650202

SCALE —— SHEET 1 OF 1

BLUE CARD

ZONE	LTR	DESCRIPTION	DATE	APPD



3. SCHEMATIC: JCE 1002

⚠ FINISH (IF APPLICABLE)

⚠ MATL (IF APPLICABLE)

NOTES: UNLESS OTHERWISE SPECIFIED

DASH	QTY	NEXT ASSY	USED ON
		1650160	
	1	END ITEM	

APPLICATION

SERIAL NO.	DATE EFF	DWG REV
1 & ON		NIC

EFFECTIVITY

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .XX ± .03; .XXX ± .010
ANGLES: 0° 30'
HOLE TOLERANCES
.013 THRU .133 +.004 −.001
.231 THRU .500 +.006 −.001
.136 THRU .250 +.006 −.001
.501 THRU .750 +.006 −.001

MATERIAL ⚠

FINISH ⚠

DO NO SCALE DWG

ENGINEERING ACTIVITY

DESIGN	JC SYSTEMS INC.
DRAFTED	" 29 JUNE 1979
CHECKED	
APPROV	
RELEASE	

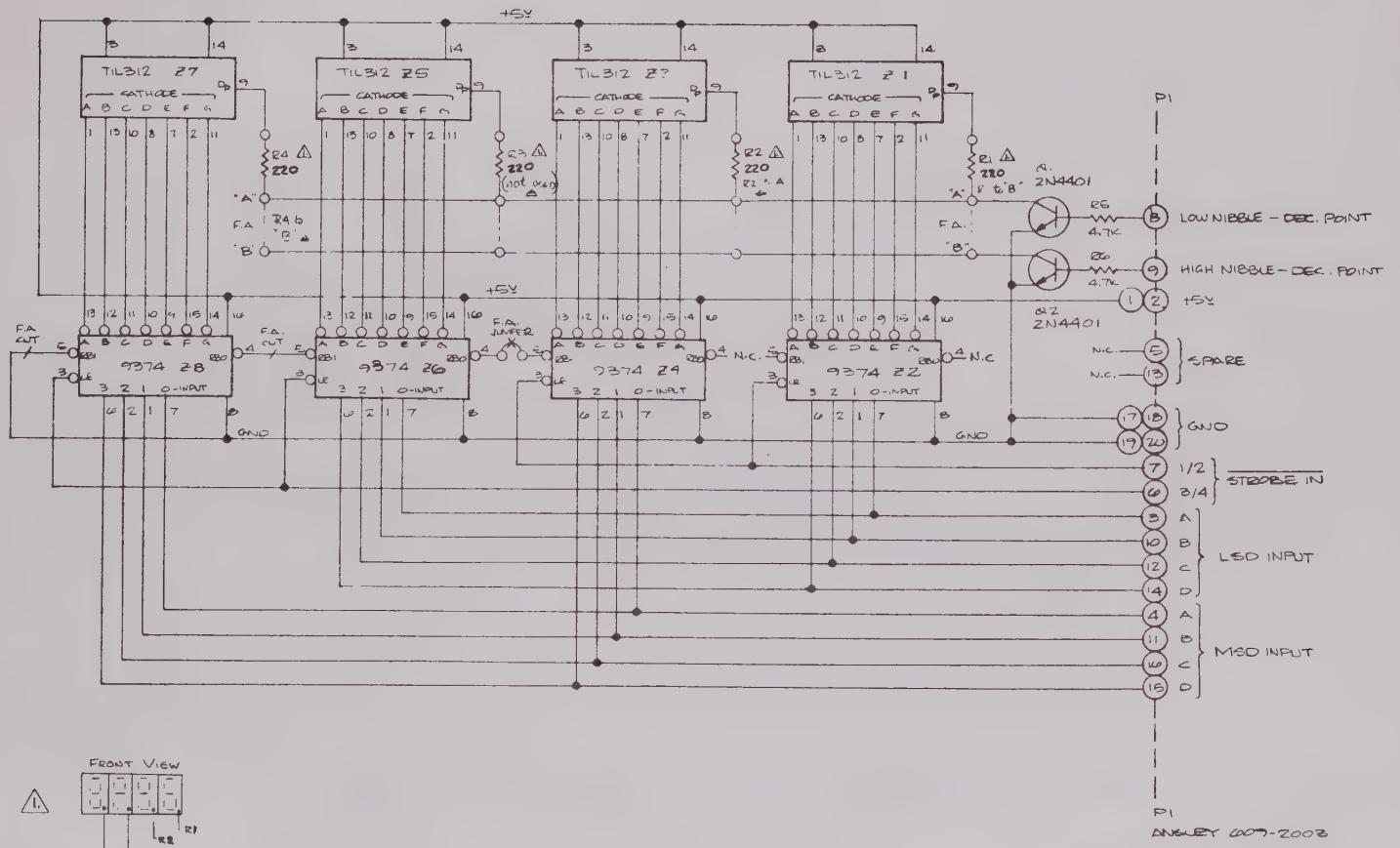
JC ENTERPRISES
SAN DIEGO, CALIFORNIA

TITLE: PRINTED CIRCUIT BD ASSY — NUMERIC DISPLAY II MODEL A1003

SIZE	CODE IDENT	
B		1003

SCALE 2:1 | 1650192 | SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPD



		1650160									
	1	A1002			.80N		N.C.				
DASH	QTY	NEXT ASSY	USED ON	SERIAL NO.		DATE EFF	DWG REV	MATERIAL	1		
APPLICATION				EFFECTIVITY				FINISH	2		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .XX ± .03, .XXX ± .010
ANGLES: 0° 30'
HOLE TOLERANCES
.013 THRU .125 +.006 −.001
.126 THRU .380 +.008 −.001
.221 THRU .375 +.006 −.001
.501 THRU .750 +.008 −.001

ENGINEERING ACTIVITY	
DESIGN	JC SYSTEMS INC
DRAFTED	" 29 JUNE 1979
CHECKED	
APPROV	
RELEASE	
DO NOT SCALE DWG	

JC ENTERPRISES

TITLE: PRINTED CIRCUIT BD SCH— NUMERIC DISPLAY II MODEL A1003

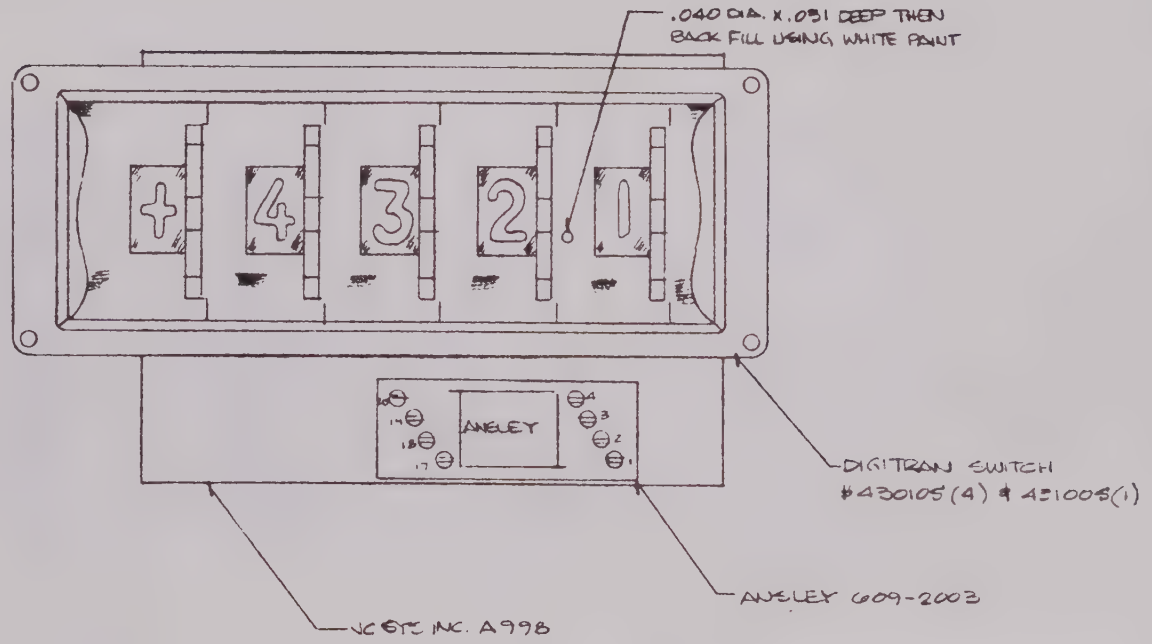
SIZE	CODE IDENT	
C		1002
SCALE N.A	1650193	SHEET 1 OF 1

⚠ FINISH (IF APPLICABLE)

MAT'L (IF APPLICABLE)

NOTES: UNLESS OTHERWISE SPECIFIED

ZONE	LTR	DESCRIPTION	DATE	APPD



3 SCHEMATIC: JCE 997

⚠ FINISH (IF APPLICABLE)

⚠ MATL (IF APPLICABLE)

NOTES: UNLESS OTHERWISE SPECIFIED

DASH	QTY	NEXT ASSY	USED ON
		1650160	
	1	EVD ITEM	

APPLICATION

SERIAL NO.	DATE EFF	DWG REV
1 & ON		N/C

EFFECTIVITY

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .XX ± .03; .XXX ± .010
ANGLES: 0° 30'
HOLE TOLERANCES

MATERIAL ⚠

FINISH ⚠

ENGINEERING ACTIVITY

DESIGN	JCETC INC.
DRAFTED	21 JUNE 1979
CHECKED	
APPROV	
RELEASE	

DO NO SCALE DWG

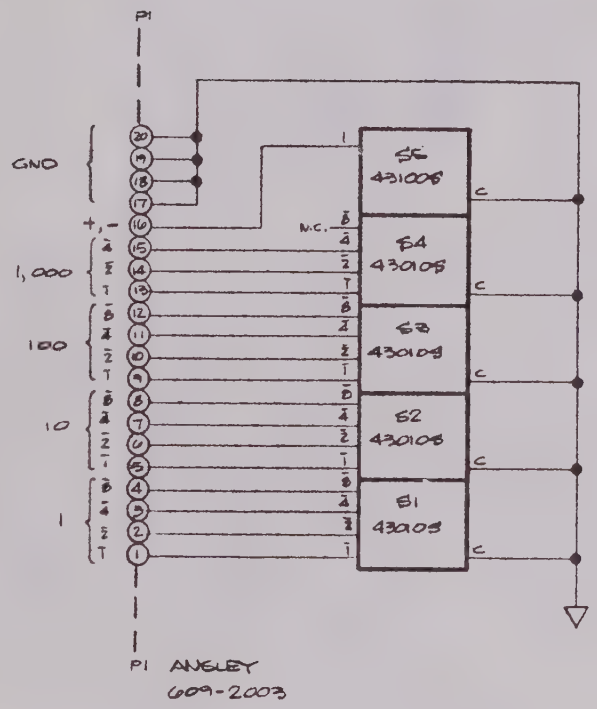
ENTERPRISES

TITLE: PRINTED CIRCUIT BD ASSY - TEMPERATURE DIGI-SWITCH II MODEL A998

SIZE	CODE IDENT	
B		998

SCALE 2:1 | 1.44594 | SHEET 1 OF 1

ZONE	LTR	DESCRIPTION	DATE	APPD



		1650160					
	1	A998		↓ ON		N/C	
DASH	QTY	NEXT ASSY	USED ON	SERIAL NO.	DATE EFF	DWG REV	
APPLICATION				EFFECTIVITY			

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .XX ± .03, .XXX ± .010
ANGLES: 0° 30'
HOLE TOLERANCES

MATERIAL ⚠
FINISH ⚠

ENGINEERING ACTIVITY

DESIGN	JC SYSTEMS INC
DRAFTED	" 22 JUNE 1979
CHECKED	
APPROV	
RELEASE	

DO NO SCALE DWG

ENTERPRISES
SAN DIEGO CALIFORNIA

TITLE: PRINTED CIRCUIT BD SCHEMATIC DIP-SWITCH II
MODEL A998

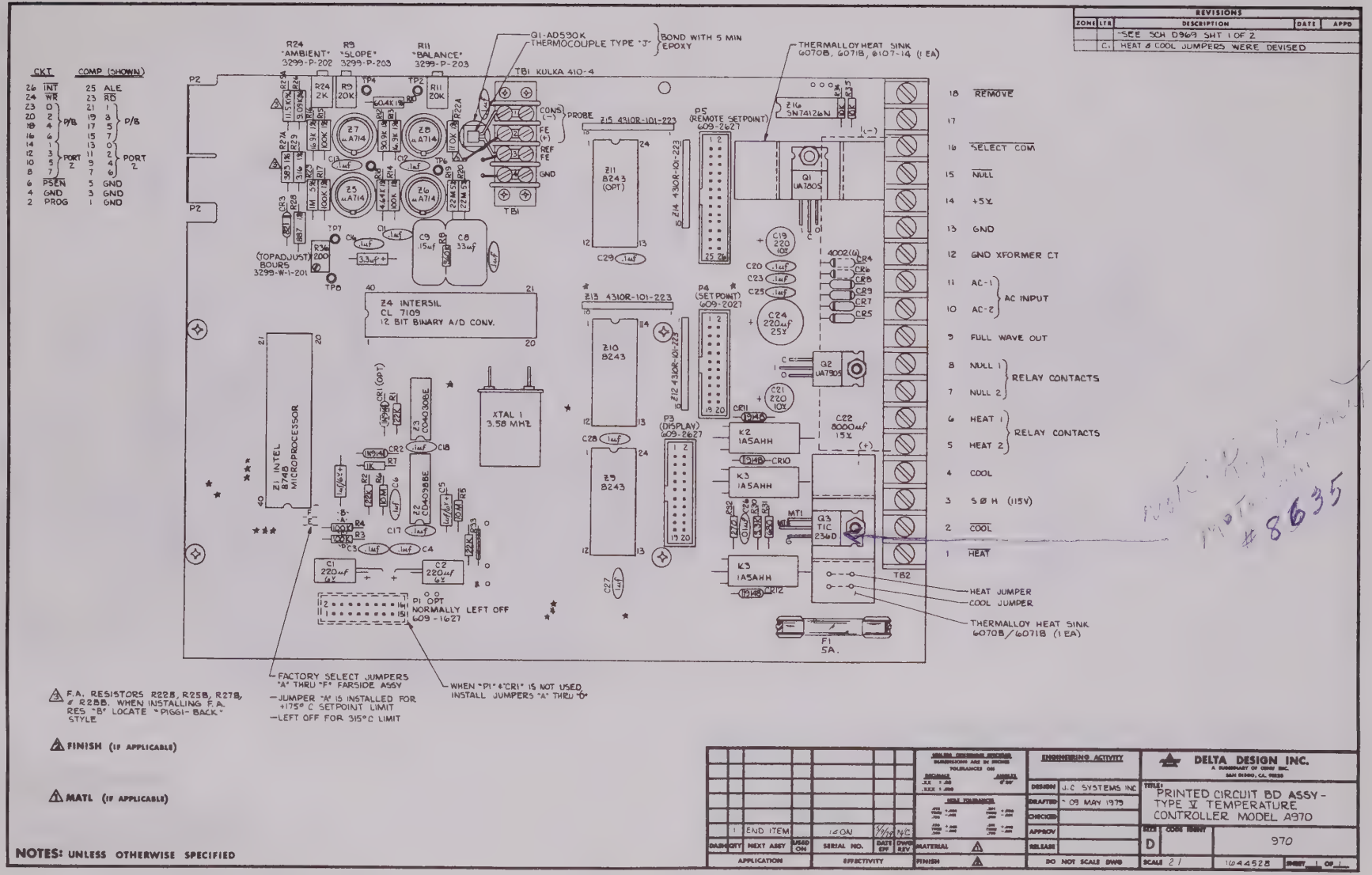
SIZE	CODE IDENT		
B		997	

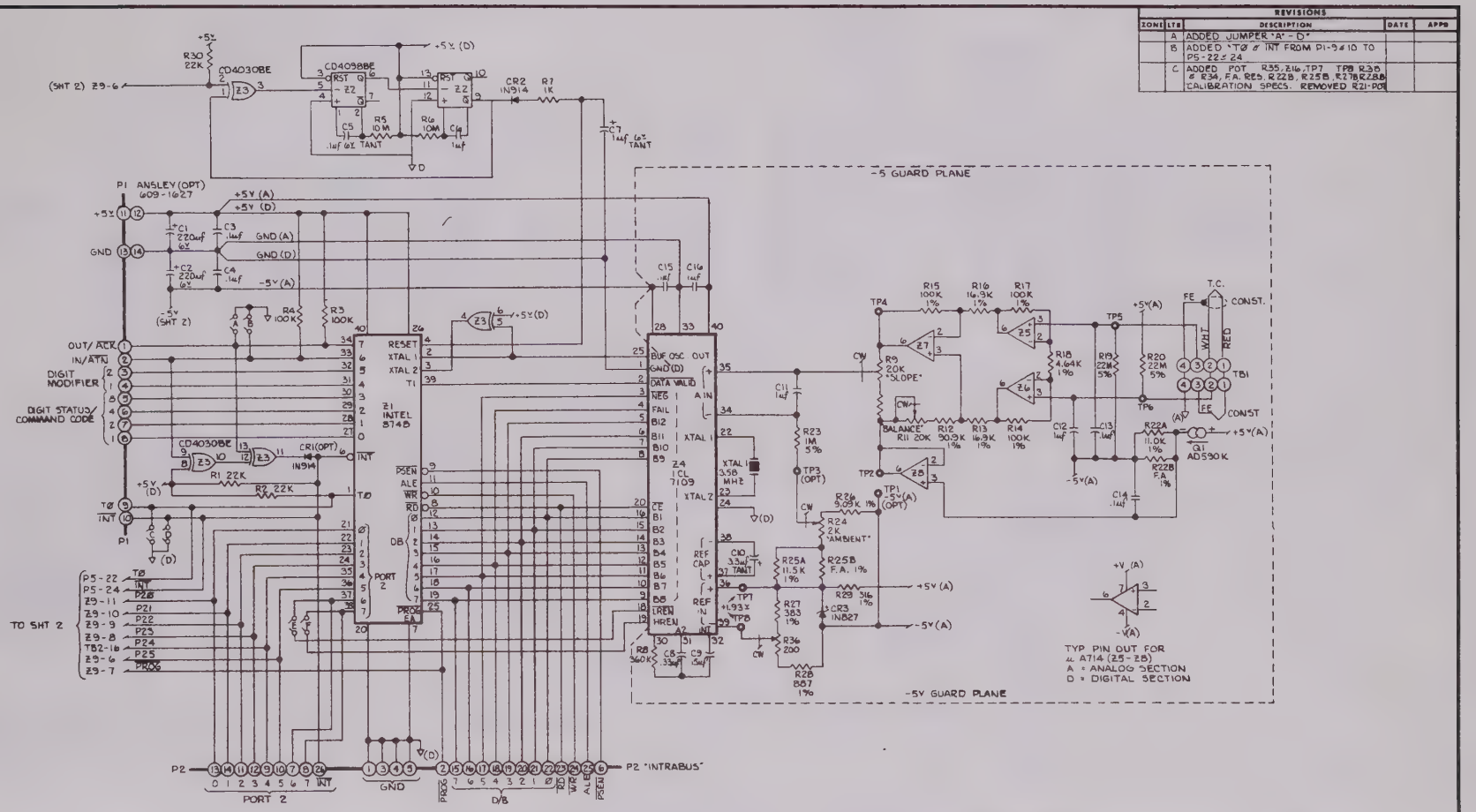
SCALE N.A. 1644548 SHEET 1 OF 1

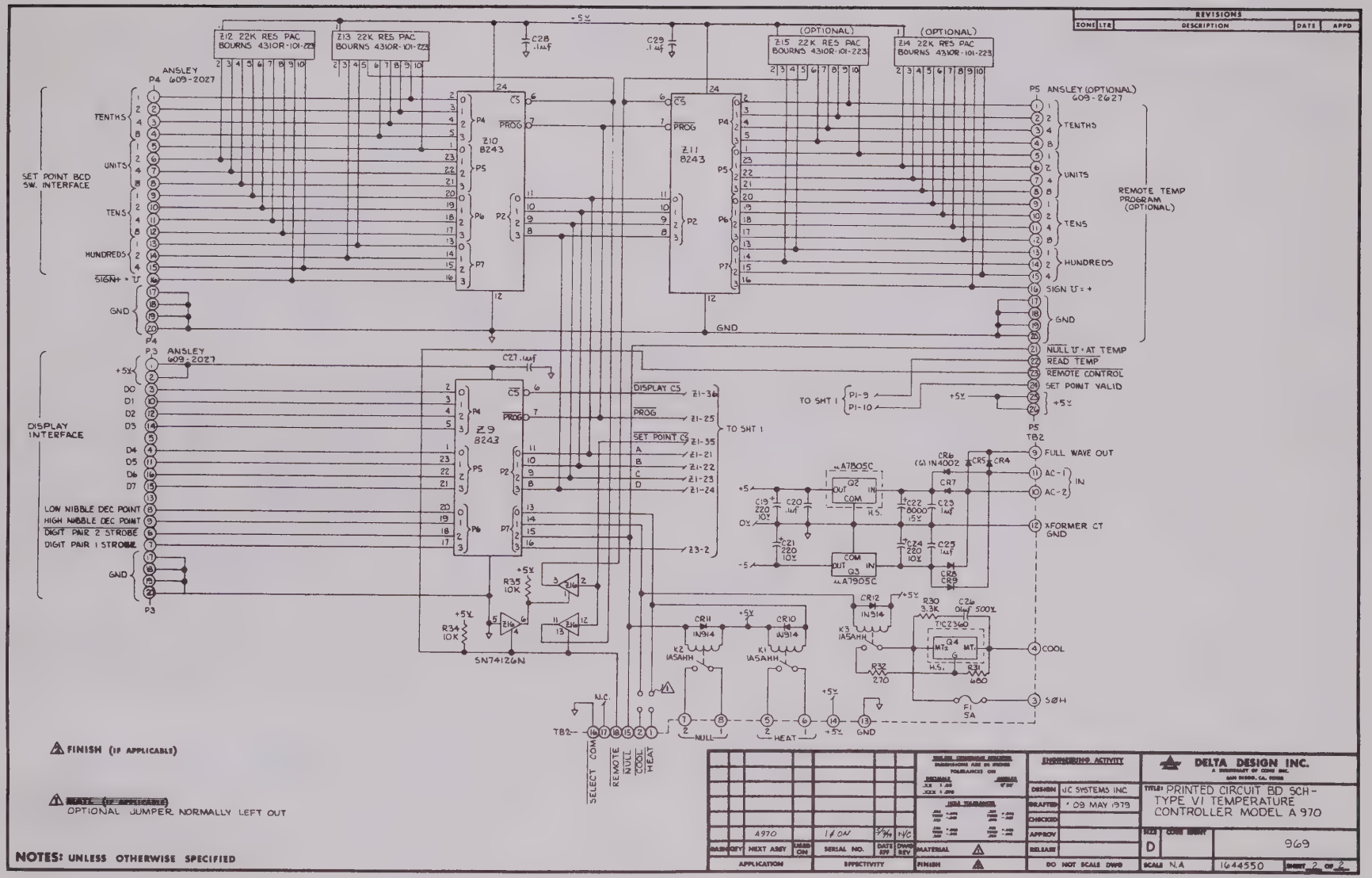
⚠ FINISH (IF APPLICABLE)

⚠ MATL (IF APPLICABLE)

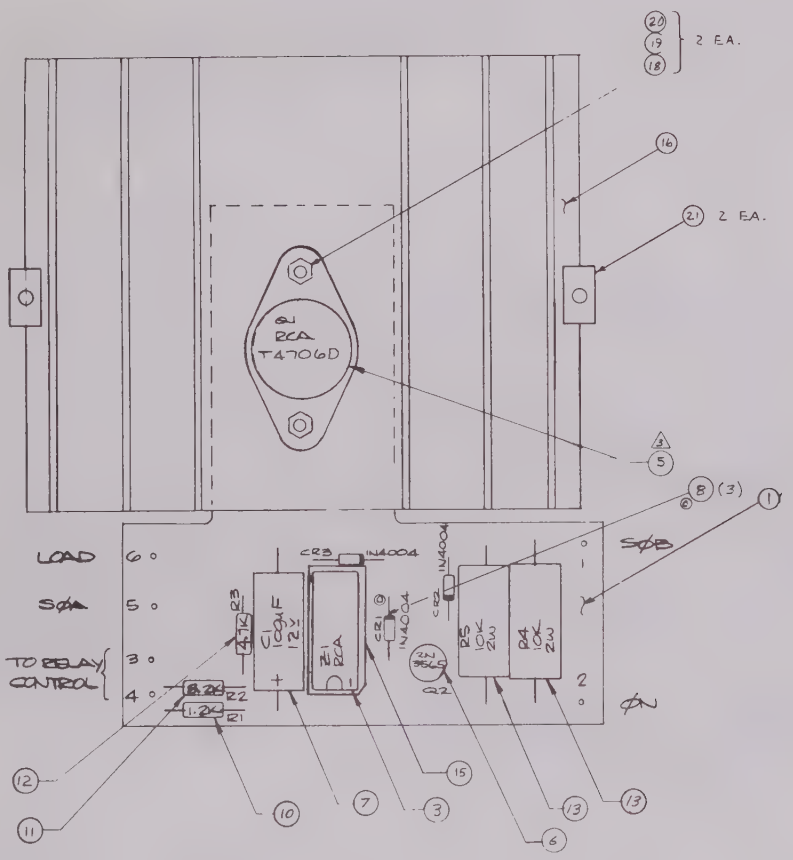
NOTES: UNLESS OTHERWISE SPECIFIED


REVISIONS
ZONE LTR DESCRIPTION DATE APPD
C. HEAT & COOL JUMPERS WERE DEVISED
CKT COMP (SHOWN)
26 INT 25 ALE
24 WR 23 RD
23 0 21 1
20 2 19 3 P/B
18 4 P/B 17 5 P/B
16 6 15 7
14 1 13 0
12 3 PORT 2 11 2 PORT 2
10 5 9 4
8 7 7 6
6 PSEN 5 GND
4 GND 3 GND
2 PROG 1 GND
R24 "AMBIENT" 3299-P-202
R9 "SLOPE" 3299-P-203
R11 "BALANCE" 3299-P-203
Q1-AD590K THERMOCOUPLE TYPE "J"
BOND WITH 5 MIN EPOXY
THERMALLOY HEAT SINK 6070B, 6071B, #107-14 (1 EA)
TB1 KULKA 410-4
CONS (-)
PROBE
FE (+)
REF FE
GND
TB1
Z15 4310R-101-223
P5 (REMOTE SETPOINT) 609-2627
Z16 SN74126N
Q1 UA7805
Z11 8243 (OPT)
Z14 4310R-101-223
C19 220 10V
C20 .1uf
C23 .1uf
C25 .1uf
C24 220uf 25V
4002(N) CR4 CR6 CR8 CR9 CR7 CR5
Q2 UA7905
C21 220 10V
C22 8000uf 15V
Z13 4310R-101-223
P4 (SETPOINT) 609-2027
Z10 8243
Z12 4310R-101-223
P3 (DISPLAY) 609-2627
Z9 8243
K2 1A5AHH
K3 1A5AHH
K3 1A5AHH
CR11
CR10
CR12
Q3 TIC 236D
MT1
TB2
Z4 INTERSIL CL 7109 12 BIT BINARY A/D CONV.
Z1 INTEL 8748 MICROPROCESSOR
XTAL 1 3.58 MHz
Z3 CD4030BE
Z2 CD4030BE
P1 OPT NORMALLY LEFT OFF 609-1627
F1 5A.
(TOPADJUST) BOURS 3299-W-1-201
18 REMOVE
16 SELECT COM
15 NULL
14 +5V
13 GND
12 GND XFORMER CT
11 AC-1
10 AC-2
AC INPUT
9 FULL WAVE OUT
8 NULL 1
7 NULL 2
RELAY CONTACTS
6 HEAT 1
5 HEAT 2
RELAY CONTACTS
4 COOL
3 S Ø H (115V)
2 COOL
1 HEAT
HEAT JUMPER
COOL JUMPER
THERMALLOY HEAT SINK 6070B/6071B (1 EA)
FACTORY SELECT JUMPERS "A" THRU "F" FARSIDE ASSY
—JUMPER "A" IS INSTALLED FOR +175° C SETPOINT LIMIT
—LEFT OFF FOR 315°C LIMIT
WHEN "P1" & "CR1" IS NOT USED INSTALL JUMPERS "A" THRU "D"
3 F.A. RESISTORS R22B, R25B, R27B, & R28B. WHEN INSTALLING F.A. RES "B" LOCATE "PIGGI-BACK" STYLE
4 FINISH (IF APPLICABLE)
5 MATL (IF APPLICABLE)
NOTES: UNLESS OTHERWISE SPECIFIED
ENGINEERING ACTIVITY
DESIGN J.C SYSTEMS INC
DRAFTED 09 MAY 1979
CHECKED
APPROV
RELEASE
DO NOT SCALE DWG
DELTA DESIGN INC.
A SUBSIDIARY OF CLIMET INC.
SAN DIEGO, CA. 92123
TITLE: PRINTED CIRCUIT BD ASSY - TYPE V TEMPERATURE CONTROLLER MODEL A970
SIZE D
CODE IDENT
970
SCALE 2/1
1044528
SHEET 1 OF 1
1 END ITEM 1 ON 5/10/79 NC
DASH NO. NEXT ASSY USED ON SERIAL NO. DATE EFF DWG REV
MATERIAL
FINISH
APPLICATION
EFFECTIVITY
#8635


REVISIONS
ZONE LTR DESCRIPTION DATE APPD
A ADDED JUMPER "A" - D"
B ADDED "T0 & INT FROM P1-9 & 10 TO P5-22 & 24
C ADDED POT R35, R36, TP7 TP8 R35 & R34, F.A. R25, R22B, R25B, R27B R28B CALIBRATION SPECS. REMOVED R21-P09
-5 GUARD PLANE
-5V GUARD PLANE
P1 ANSLEY (OPT) 609-1627
TO SHT 2
P2 "INTRABUS"
PORT 2
GND
D/B
TYP PIN OUT FOR μ A714 (25-28)
A = ANALOG SECTION
D = DIGITAL SECTION
CONST.
BALANCE R11 20K
R9 20K "SLOPE"
R24 2K "AMBIENT"
Z1 INTEL 8748
Z4 ICL 7109
Q1 AD590K
CR1(OPT) IN914
CR2 IN914
CR3 IN827
FINISH (IF APPLICABLE)
MATL (IF APPLICABLE)
NOTES: UNLESS OTHERWISE SPECIFIED
DELTA DESIGN INC.
A SUBSIDIARY OF CONV INC.
SAN DIEGO, CA. 92123
TITLE: PRINTED CIRCUIT BD SCH - TYPE V TEMPERATURE CONTROLLER MODEL A970
DESIGN J C SYSTEMS INC
DRAFTED 03 MAY 1979
SIZE D
969
SCALE N A
1044550
SHEET 1 OF 2


REVISIONS
ZONE LTR DESCRIPTION DATE APPD
+5V
Z12 22K RES PAC BOURNS 4310R-101-223
Z13 22K RES PAC BOURNS 4310R-101-223
C28 .1uF
C29 .1uF
(OPTIONAL) Z15 22K RES PAC BOURNS 4310R-101-223
(OPTIONAL) Z14 22K RES PAC BOURNS 4310R-101-223
ANSLEY P4 609-2027
SET POINT BCD SW. INTERFACE
TENTHS
UNITS
TENS
HUNDREDS
SIGN+ = U
GND
Z10 8243
Z11 8243
P5 ANSLEY (OPTIONAL) 609-2627
REMOTE TEMP PROGRAM (OPTIONAL)
SIGN U = +
NULL U+AT TEMP
READ TEMP
REMOTE CONTROL
SET POINT VALID
P3 ANSLEY 609-2027
DISPLAY INTERFACE
DO
D1
D2
D3
D4
D5
D6
D7
LOW NIBBLE DEC POINT
HIGH NIBBLE DEC POINT
DIGIT PAIR 2 STROBE
DIGIT PAIR 1 STROBE
C27 .1uF
Z9 8243
DISPLAY CS
PROG
SET POINT CS
A
B
C
D
TO SHT 1
TO SHT 1 P1-9
P1-10
+5V
P5 TB2
FULL WAVE OUT
AC-1
AC-2
IN
XFORMER CT GND
A7805C
A7905C
CR6 (6) IN4002
CR5
CR4
CR7
C19 220 10V
C20 .1uF
C21 220 10V
C22 8000 15V
C23 .1uF
C24 220 10V
C25 .1uF
CR8
CR9
R35 10K
R34 10K
SN74126N
CR11 IN914
CR10 IN914
K2 IASAHH
K1 IASAHH
K3 IASAHH
CR12 IN914
R30 3.3K
C26 .01uF 500V
T1C2360
Q4
R32 270
R31 680
F1 5A
COOL
SØH
NULL
HEAT
GND
TB2
N.C.
SELECT COM
REMOTE
NULL
COOL
HEAT
FINISH (IF APPLICABLE)
OPTIONAL JUMPER NORMALLY LEFT OUT
NOTES: UNLESS OTHERWISE SPECIFIED
DELTA DESIGN INC.
A DIVISION OF CORE INC.
SAN DIEGO, CA. 92123
ENGINEERING ACTIVITY
DESIGN VC SYSTEMS INC.
DRAFTED 09 MAY 1979
CHECKED
APPROV
RELEASE
DO NOT SCALE DWG
TITLE: PRINTED CIRCUIT BD SCH - TYPE VI TEMPERATURE CONTROLLER MODEL A 970
SIZE D
CODE IDENT 96 9
SCALE N.A
1644550
SHEET 2 OF 2
A970
1 OF ON
SERIAL NO.
MATERIAL
APPLICATION
EFFECTIVITY
FINISH

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ADDED ITEM NO PER ECN M030 Za	10-11-72	L. ELLIS 10-27-72
	B	ADDED ITEM 10. PER ECN M061 Harris 11-9-72	11-9-72	L ELLIS
	C	PER ECN M191 R Brooks 3-7-73 ADDED CR1, ITEM 11	3-24-73	A.Desai
	D	PER ECN M385 DTD 9/24/73 FJO ADDED CR2 (1N4004)	9/24/73	A. Desai
	E	PER ECN M617 DATED 4/18/74 - GKH - ADDED Q2(2N3565), CR3 (1N4004), Q1 WAS 40716	4/18/74	
	F	PER ECN M739 R Brooks 6-21-74 SEE ECN FOR CHANGE		M. B 6-28-74



P/L "A" SIZE

QTY REQ'D	NOMENCLATURE OR DESCRIPTION	CODE IDENT	IDENTIFYING NUMBER	SPECIFICATION	MATERIAL OR NOTE	ITEM NO

1) ENG. REF: 15 AMPS RESISTIVE MAX. CURRENT RMS

2) SCHEMATIC REF: C1635446

3. RCA 40716 IS A SUBSTITUTABLE PART FOR ITEM 5 RCA T4706D

NOTES:

MULTI. USAGE				
—	A1161	TYPE III 140V		
—	A1160	TYPE III 120V		
NEXT ASSY	USED ON	SERIAL NOS	DATE EFF	DWG REV. LTR.
APPLICATION		EFFECTIVITY		

UNLESS OTHERWISE SPECIFIED THE FOLLOWING APPLIES
BREAK ALL SHARP EDGES .005
MAX SURFACE ROUGHNESS 125 RMS
THDS INT CL 2B EXT CL 2A
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± 1/64 ANGLES ± ½°
DECIMALS .XX ± .010
.XXX ± .005

MATERIAL ~

FINISH ~

DO NOT SCALE DRAWING

PART NO 2635445

	BY	DATE
DESIGN	M.W.TYLER	2-16-72
DRAFTED	M.W.TYLER	2-16-72
CHECKED		5-1-72
APPROV	L. ELLIS	10-6-72

DELTA DESIGN INC.
8000 FLETCHER PKWY
LA MESA CALIF 92041
TEL A/C (714) 465 4141

TITLE: 120/240 X TRIAC ASS'Y

SIZE	CODE IDENT NO	DRAWING NO	REV. LTR
C		2635445	F

SCALE 2:1 SHEET 1 OF 1

BLUE CARD

P.L. 2635445 REV ____ SHT 1 OF 1

DESCRIPTION TRIAC ASSY 120/240 VOLT

NEXT ASSY END ITEM BY ____ CK'D ____ APPD ____

REV	ECN	DATE	BY	APP

DELTA DESIGN
5725 KEARNY VILLA RD
SAN DIEGO, CALIF

JOB NO. ____ S.O. NO ____

QTY ____ PROM DATE ____ ACT ____

RUN * ____ MACH ____

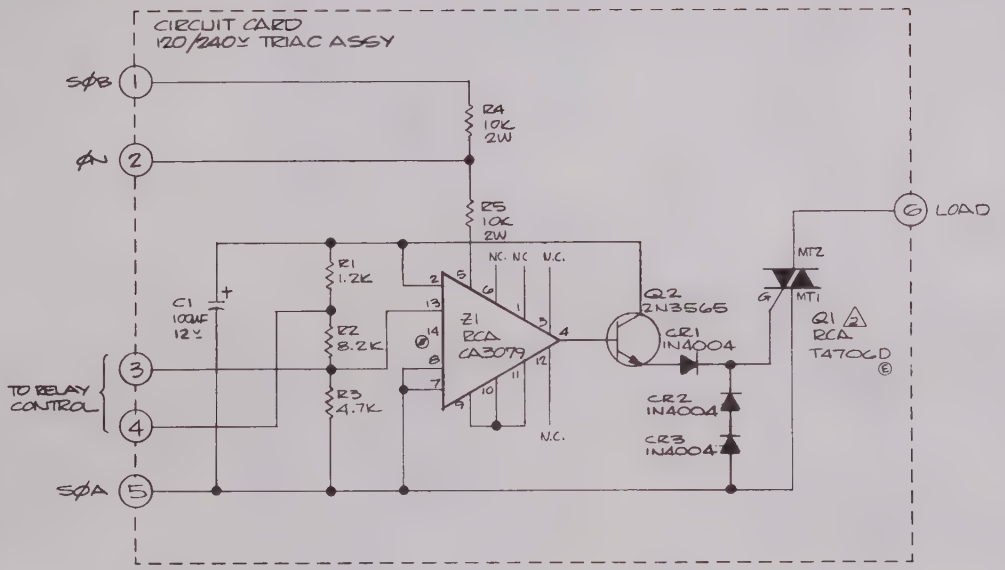
ITEM NO	ASSY & QTY -001	-002	-003	-004	INDENTURE	SIZE	DRAWING NO.	REV	DESCRIPTION	MFG OR MFG NO.	STOCK OR PART NO.
00	X					C	2635445		TRIAC ASSY 120/240	VOLT	2635445-001
00	REF					C	1635446		SCHEMATIC 120/240	VOLT TRIAC	
00	REF					B	1635443		ARTWORK 120/240 VOLT TRIAC		
01	1					C	1635444		P.C. BOARD 120/240	VOLT TRIAC	1635444-101
02											
03	1								INTEGRATED CIRCUIT Z1	RCA CA3079	1000026
04											
05	1								TRIAC Q1	RCA T4706B ⚠1	124706
06	1								TRANSISTOR Q2	2N3565	1203565
07	1								CAPACITOR 100 uf	12V C1 SPRIGUE	0510147-051
08	3								DIODE CR1, CR2, CR3	IN4004	1104004
09											
10	1								RESISTOR, 1.2K, 1/4W, 5% R1		4045000-122
11	1								RESISTOR, 8.2K, 1/4W, 5% R2		4045000-822
12	1								RESISTOR, 4.7K, 1/4W, 5% R3		4045000-472
13	2								RESISTOR, 10K, 2W 5% R4, R5		0310032-103
14											
15	1								SOCKET, I/C 14 PIN		1710283-001
16	1					B	1603051		HEAT SINK		1500351
17											
18	2								6-32 X 1/2 PHP-MS-	SST	6806321-204
19	2								#6 LWT-	SST	6606020
20	2								6-32 HN-	SST	6706320
21	2								STANDOFF HEAT SINK		1500329

NOTES:

⚠1 RCA 40716 MAY BE SUBSTITUTED FOR ITEM 5.

P/L 2635445

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ECN CHANGE PER M030	10-11-72	L. ELLIS 10-27-72
	B	PER ECN M131 R Brown 3-7-73 ADDED CR1 (IN4007) REMOVED CONNECTION OF Z1 PIN 14 TO 13	9-24-73	A. Desai
	C	PER ECN M385 DTD 9/24/73 E.J.O. ADDED CR2 (IN4004)	9/24/73	A. Desai
	D	PER ECN M617 DATED 4-18-74 - GKJ - ADDED Q2 (2N3565), CR3 (IN4004) Q1 WAS 40716	4/18/74	Kamin
	E	PER ECN M739 R Brown 6-20-74 ADDED NOTE 2 & Q1 WAS T4706B		M. Bell 6-28-74



QTY REQ'D	NOMENCLATURE OR DESCRIPTION	CODE IDENT.	IDENTIFYING NUMBER	SPECIFICATION	MATERIAL OR NOTE	ITEM NO.

② RCA PART NO. 40716 IS A SUBSTITUTABLE PART FOR Q1 RCA T4706D

1. ALL RESISTORS ¼W, 5%, CARBON.

NOTES: UNLESS OTHERWISE INDICATED.

NEXT ASSY.	USED ON	SERIAL NOS.	DATE EFF.	DWG. REV. LTR.
2635445	A1160 & A1161			
APPLICATION		EFFECTIVITY		

UNLESS OTHERWISE SPECIFIED THE FOLLOWING APPLIES:
BREAK ALL SHARP EDGES .005
MAX. SURFACE ROUGHNESS 125 RMS
THDS. INT. CL. 2B, EXT CL. 2A
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± 1/64 ANGLES ± ½°
DECIMALS .XX ±.010
.XXX ±.005

MATERIAL: ~

FINISH: ~

	BY	DATE
DESIGN	J.C. ENT.	2-14-72
DRAFTED	M. LM TYLER	2-16-72
CHECKED	GK	5-1-72
APPROV.	L. ELLIS	10-19-72

DO NOT SCALE DRAWING

PART NO ~

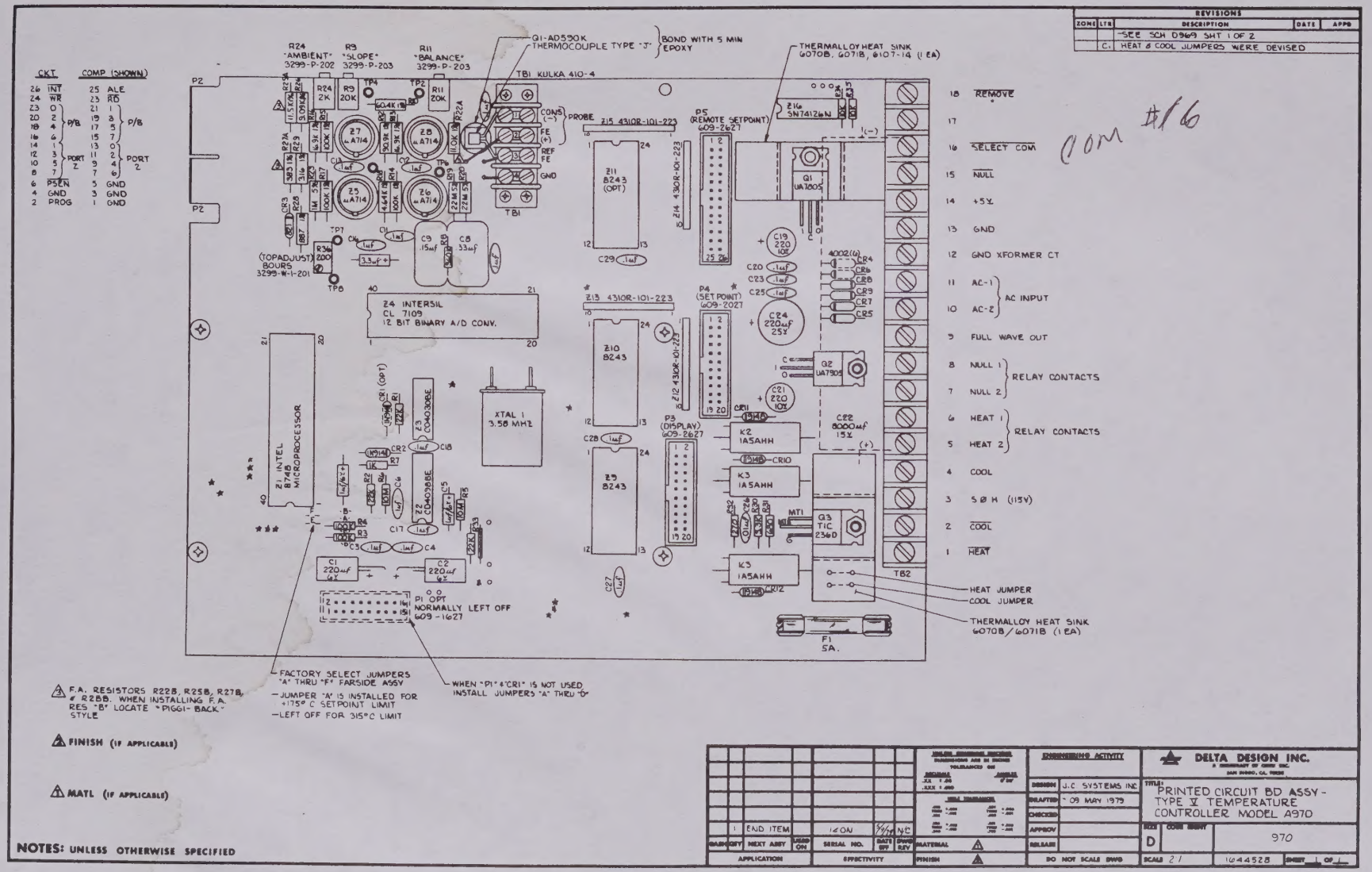
DELTA DESIGN INC.
8000 FLETCHER PKWY.
LA MESA, CALIF 92041
TEL. A/C (714) 465-4141

TITLE : SCHEMATIC – : 120/240V TRIAC

SIZE	CODE IDENT NO	DRAWING NO	REV LTR
C		C1635446	E

SCALE NONE SHEET 1 OF 1

BLUE CARD


REVISIONS
ZONE LTR DESCRIPTION DATE APPD
C. HEAT & COOL JUMPERS WERE DEVISED
CKT COMP (SHOWN)
R24 "AMBIENT" 3299-P-202
R9 "SLOPE" 3299-P-203
R11 "BALANCE" 3299-P-203
Q1-AD590K THERMOCOUPLE TYPE "J"
BOND WITH 5 MIN EPOXY
THERMALLOY HEAT SINK 6070B, 6071B, 6107-14 (1 EA)
TB1 KULKA 410-4
PROBE
P5 (REMOTE SETPOINT) 609-2627
Z16 SN74126N
Z15 4310R-101-223
Z14 4310R-101-223
Z11 8243 (OPT)
Z13 4310R-101-223
Z12 4310R-101-223
Z10 8243
Z9 8243
P4 (SETPOINT) 609-2027
P3 (DISPLAY) 609-2627
Z4 INTERSIL CL 7109 12 BIT BINARY A/D CONV.
Z1 INTEL 8748 MICROPROCESSOR
Z3 CD4030BE
Z2 CD4030BE
XTAL 1 3.58 MHz
Q1 UA1305
Q2 UA7905
Q3 TIC 236D
K2 1A5AHH
K3 1A5AHH
K3 1A5AHH
MT1
P1 OPT NORMALLY LEFT OFF 609-1627
F1 5A.
TB2
18 REMOVE
16 SELECT COM
15 NULL
14 +5V.
13 GND
12 GND XFORMER CT
11 AC-1
10 AC-2
AC INPUT
9 FULL WAVE OUT
8 NULL 1
7 NULL 2
RELAY CONTACTS
6 HEAT 1
5 HEAT 2
RELAY CONTACTS
4 COOL
3 SØH (115V)
2 COOL
1 HEAT
HEAT JUMPER
COOL JUMPER
THERMALLOY HEAT SINK 6070B/6071B (1 EA)
FACTORY SELECT JUMPERS "A" THRU "F" FARSIDE ASSY
—JUMPER "A" IS INSTALLED FOR +175° C SETPOINT LIMIT
—LEFT OFF FOR 315°C LIMIT
WHEN "P1" & "CR1" IS NOT USED INSTALL JUMPERS "A" THRU "D"
F.A. RESISTORS R22B, R25B, R27B, & R28B. WHEN INSTALLING F.A. RES "B" LOCATE "PIGGI-BACK" STYLE
FINISH (IF APPLICABLE)
MATL (IF APPLICABLE)
NOTES: UNLESS OTHERWISE SPECIFIED
DELTA DESIGN INC.
PRINTED CIRCUIT BD ASSY - TYPE V TEMPERATURE CONTROLLER MODEL 970
970
1044528

COM #16

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ESSELTE
10%

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